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JOHN GOODRICH CLARK, M.D.

1867-1927

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IN MEMORIAM

JOHN GOODRICH CLARK, M.D.

After a long illness, Dr. John Goodrich Clark, William Goodell Professor of Gynecology in the University of Pennsylvania, died on May 4, 1927. Doctor Clark was born in Economy, Indiana, June 4, 1867, the son of Thomas E. and Nancy Goodrich Clark.

At fourteen years of age, he entered the preparatory school of Earlham College, Richmond, Indiana, remaining there two years. He matriculated in the Ohio Wesleyan University where he became a member of the Beta Theta Pi fraternity. At the completion of his sophomore year, he entered a United States civil engineering party detailed for the survey of the Nez Perces Indian Reservation in northern Idaho. He later joined a party occupied in the survey of the Utah and Northern Railroad in the capacity of topographer and later that of levelman. This event exerted a profound impression upon his life and remained as one of his fondest memories. Upon the completion of the survey, he entered the Medical School of the University of Pennsylvania and was graduated with honors in 1891.

Doctor Clark served as resident physician in the St. Agnes and Children's Hospital of Philadelphia and in the surgical wards of the Bellevue Hospital, New York. He then entered the Johns Hopkins Hospital where he remained several years, serving first as anesthetist, then as assistant resident and finally as resident gynecologist in the service of Doctor Howard A. Kelly.

In order to carry out his investigation of problems dealing with the life history of the corpus luteum, he entered the anatomical laboratory of the University of Leipzig under Professors His and Spalteholz. Upon the completion of this work he went to the University of Prague and studied under Professor Chiari. After his return to this country in 1899, he received the appointment of Associate in Gynecology at Johns Hopkins and later in the same year, Professor of Gynecology in the University of Pennsylvania. In 1922, he was appointed to the William Goodell Chair of Gynecology at Pennsylvania which he occupied until his resignation a short time before his death.

Doctor Clark was an active member of many of the leading medical organizations of the country and the high esteem in which he was held is shown by the positions of honor bestowed upon him by these societies. He was Chairman, Section of Obstetrics, Gynecology and Abdominal Surgery, American Medical Association; Vice-president and President of the American Gynecological Society and President of the Clinical Congress of Surgeons. During the war, he was a member of the Council of National Defence, to which he gave unsparingly of his time and energy. He was an honorary member of the Washington State Medical Society, the Kansas City Medical Society and the Edinburgh Obstetrical Society.

As an author, Doctor Clark was a large contributor to medical literature and these contributions reflect originality of thought, a wide range of vision, and a sane conservatism which was so characteristic of the man. With Werder and Ries, he was a pioneer in advocating more radical measures in dealing with carcinoma of the uterus; his paper on peritoneal drainage focused attention upon this important subject; his studies on the life history of the corpus luteum received international recognition and during recent years, his writings made him one of the leading authorities on radiotherapy as applied to gynecologic therapeusis.

Doctor Clark was preeminent as a teacher, combining the faculty of transmitting his knowledge with a personal charm and strength of character which commanded the devotion and respect of his students.

During his term of service as Gynecologist in Chief to the University Hospital in Philadelphia, he built up a department which was recognized as a model of efficiency. "Ward K" was the pride of his heart. To it he gave the best that was in him, and from it he received in full measure the devotion of those under his care. This ward with its spirit of good cheer and willingness to help those in affliction, stands as a monument to his personality.

Doctor Clark scaled the heights of professional attainment, but even above this stood that wonderful personality and strength of character which made him universally loved and esteemed. He was one of God's noblemen, a loyal friend, a true comrade. We mourn his loss and pay reverent tribute to his memory, but his spirit lives on, casting its beneficent influence upon the lives of those who prided themselves in his friendship.

FLOYD E. KEENE.

Dr. Clark was a member of the Advisory Board of this Journal from the time of its organization, and to the above, the Editor, on behalf of himself and his associates, desires to add a personal tribute to his memory. His deep interest in the publication and his very helpful advice and service, so generously extended on many occasions, are herewith gratefully acknowledged.

Original Communications

CHANGES IN METABOLISM AND THEIR RELATION TO THE TREATMENT OF VOMITING OF PREGNANCY*

By W. J. Dieckmann, B.S., M.D., and R. J. Crossen, A.B., M.D.,
St. Louis, Mo.

(From the Department of Obstetrics, Washington University School of Medicine and Barnes Hospital)

THE literature on pernicious vomiting of pregnancy is constantly increasing, and as the number of reports increase, the theories as to etiology, treatment and other phases have likewise increased, until now they are almost legion. Theories as to the etiology vary from a pure neurosis to a circulating toxin. Similarly, one obstetrician treats his cases with glandular products, while another advocates immediate abortion. As stated in a previous publication, we still believe in the carbohydrate deficiency theory as promulgated by both Harding and Titus.

Since nausea and vomiting occur in every other pregnant woman and pernicious vomiting is always preceded by the ordinary nausea and vomiting, therefore, according to Williams, it may be assumed that the severe vomiting is due to an increase of some "toxic substance." On the other hand, normal pregnancy borders so closely on the pathologic and there are so many changes in the different organs that some disturbance of function might be considered more reasonable.

Hasselbach and Gammeltoft, and others, found decreased alveolar CO_2 tension throughout pregnancy. Losee and Van Slyke, Cook and Osman, Williamson and others, have found that the carbon dioxide combining power of the blood is decreased in pregnancy. Harding reports a personal statement by Cook who found a definite decrease in the combining power three days after the first missed period. Many workers have concluded that the decreased CO_2 combining power indicates a mild or borderline acidosis. Determination of the CO_2 combining power, however, gives no index of the actual acid-base equilibrium, which can be found only by determining two of the following—CO_2 combining power, P_H of the blood, or the alveolar CO_2 tension. Marrack and Boone concluded from determinations of the

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*Read before the Joint Meeting of the Chicago and St. Louis Gynecological Societies, Nov. 27, 1926.

Note: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

CO_2 combining power and the P_H of the plasma that normally in pregnancy the acid-base relations are normal, or a mild alkalosis exists.

The determination of the NH_3 coefficient of the urine is valueless as a prognostic aid and we thought it had been discarded, but one still finds reports of abortion being done because of an increased coefficient. The low total urinary nitrogen in vomiting of pregnancy cases would naturally increase the proportion of NH_3, while the starvation and dehydration with the continual production of acids requiring neutralization would cause marked NH_3 formation by the kidney, as the latter, according to Benedict and Nash, produces all of the NH_3. The latter statement has been attacked by Bliss, who states that NH_3 formation is a generalized tissue phenomenon, and that in vomiting NH_3 is eliminated in the vomitus. Benedict and Nash have reviewed the data presented by Bliss and find it lacking conclusiveness. Folin, Robinson and others have observed normal persons on high caloric, fat and carbohydrate diets and have found that as the urinary total nitrogen decreases, the percentage of NH_3 increases. Smith has recently observed a normal person on a diet of fat and carbohydrate amounting to 3000 to 3500 calories and noted that when the urinary total nitrogen reached 2 grams the proportion of NH_3 was 17 per cent. Whether Benedict and Nash, or Bliss is correct, however, NH_3 is not produced entirely in the liver as its value as a prognostic index in vomiting of pregnancy presupposes.

A large percentage of pregnant women are troubled with constipation with its attendant factors. Alvarez states that the pelvic engorgement consequent on pregnancy causes intestinal irritability and reverse peristalsis, terminating in nausea and vomiting.

Nakai found early in pregnancy a hypochlorhydria of the gastric contents. Arzt, of our department, has found in early pregnancy a marked hypoacidity. The majority of cases of "morning sickness" observed by him showed an achlorhydria of the fasting contents.

We have not been able to find any report of the nitrogen balance in pregnant women earlier than ten weeks gestation. Harding has found in vomiting of pregnancy patients (none earlier than ten weeks) a low positive, and at times a negative balance, and he has also noted that *minimal amounts of glucose spare the protein more quickly than in* the nonpregnant. It is well known that during the latter half of pregnancy the woman has a very low urinary nitrogen as compared to the protein intake. Bar found that in the dog there was a period of negative nitrogen balance which corresponded closely with the development of the placenta, and at about the time of completion of the placenta the balance becomes positive. In one of his animals he observed a distaste for food and actual vomiting during this period and concluded that associated with the nitrogen loss was a so-called "physiologic vomiting."

Ketonuria and glycosuria are common in pregnancy. Porges and Novak, and Pritzi and Lichtmann, have found that the pregnant woman will have a ketonuria in a few hours on a carbohydrate free diet. Harding has attempted to show that the threshold for ketosis in pregnancy is similar to the nonpregnant. We think that in dealing with such a complex subject as the ketogenic balance of the maternal and fetal bodies, his assumption as to the weight and metabolic requirements of the fetus are too conclusive. Furthermore, the earliest case studied by him was one who had a pregnancy of five months' duration; and we believe that the metabolic changes associated with and causing vomiting of pregnancy are limited to the first trimester. Harding found that even with relatively small amounts of carbohydrate the nitrogen excretion was decreased (protein sparing action of carbohydrate). Thus it appears possible that a lack of carbohydrate, or a disturbance in its metabolism is responsible for the perverted fat catabolism which we see, and that protein destruction (from the tissues) takes place to provide its portion of carbohydrate. It may be stated here that all of the vomiting cases who were cured went through the rest of the pregnancy without any signs of further toxemia. Occasional attacks of nausea and vomiting might occur, but we had few recurrences. The subsequent treatment was purely dietary, that is, maintaining a high carbohydrate diet. We have also found that patients who had marked nausea and vomiting with the first pregnancy have gone through subsequent pregnancies without any or very little nausea and vomiting, providing they were properly supervised.

The period for "morning sickness" and vomiting of pregnancy begins with the third to sixth week and terminates, usually spontaneously, at the twelfth to fourteenth week. It is during this period that the rate of growth is greatest. By the end of the first month it has been calculated that the ovum has increased in size 10,000 times; at the end of the second month, 74 times, and by the end of the third month, 11 times, and during the tenth month the rate of growth is only 0.3 times. The actual increase in size is relatively small but the changes caused by pregnancy must be tremendous, for marked alteration in the maternal metabolism can be detected in the first month. Furthermore, the uterus in pregnancy increases in size from an organ weighing 30 gm. to one of 1000 gm., and this growth is chiefly during the first three months. During this period the nutrition of the ovum is derived entirely from the surrounding serum. Inasmuch as the food must go through cell walls, only fat, carbohydrates and amino acids are available. Fat has never been demonstrated passing through to embryo or fetus, nor is there any special storage of fat in the endometrium. On the other hand, there is a large storage of glycogen in the premenstrual endometrium which is augmented in the decidua and continued by the placenta. Furthermore, glucose is not only more easily available than amino acids, but can gain entrance to the ovum by osmosis, while the amino acids, at least later in pregnancy and presumably in early pregnancy as well, require some fixing on the fetal side. In addition, it is at the end of the first trimester that the nausea and vomiting usually cease, and it is about this time that the placenta has become differentiated as we find it at term, so that amino acids and glucose can be absorbed by the villi from the circulating blood. Thus the "morning sickness" in women may be similar to the "physiologic vomiting" noted by Bar in his dogs.

It is well known that the liver is the great storehouse of glycogen and that the greatest part of the glycogen can be removed relatively fast. O'Neil reports that during typical canine anaphylactic shock the hepatic glycogen practically disappears and that the central half of each lobule often becomes free from suitable granules within three minutes. Mottram has shown that often in pregnancy of nervous or ill-nourished animals the liver becomes overloaded with fat, and that a simple hunger of a few hours' duration, in some animals, led to the same condition. Whipple et al., Opie and Graham, have each shown that a fatty liver is more liable to the central necrosis caused by systemic poisons, for example—chloroform or phosphorus; and, conversely, that a liver with necrosis recovers in a shorter period of time if the diet is mainly carbohydrate. Thus, the pathologic lesion found in vomiting of pregnancy may be accounted for.

Hofbauer considers that even in normal pregnancy the liver presents characteristic changes, so that one is justified in speaking of the "liver of pregnancy." The changes consist in the appearance of fat in the cells occupying the central portion of the lobules, the disappearance of glycogen, and the dilatation of the biliary channels, the central veins and the afferent capillaries. Opitz has cast grave doubt upon these statements, nor have we been able to find any increase of fat in the liver of patients dying during pregnancy; but should such changes occur as regular concomitants of pregnancy, they would offer a satisfactory explanation for several of the alterations in metabolism which characterize the condition.

The exciting cause of the change from morning sickness to severe vomiting of pregnancy may be constipation, some nervous irritation, a period of starvation, a dietary indiscretion, a nasopharyngitis or sinusitis causing vomiting, etc. Once vomiting has started the vicious circle has begun, and starvation and dehydration with their sequelae soon produce the well-known blood and urinary findings, and probably the lesions of the liver associated with vomiting of pregnancy follow these.

Harding and coworkers in various publications on vomiting of pregnancy, have reported the following:—The plasma CO_2 content is usually within normal limits or increased (rarely low) and there is usually a normal acid-base balance, therefore, alkalies are contraindicated. They have also reported normal or decreased chlorides in some of their cases and thought the decrease due to the dehydration. They have stated that the plasma proteins were increased, due to dehydration. Increased N. P. N., urea and uric acid have also been found by them. The extreme variability of uric acid found in high fat and low carbohydrate diet, fasting (which is fat and protein), and other conditions (Harding, Lenox and Gamble and coworkers) indicate, we believe, that the blood uric acid is very variable and of no value as a prognostic guide. Increased N. P. N. was attributed by them to concentration of the blood with resultant renal impairment, as reported by Marriott in anhydremia in infants. Harding also concludes that the excretion of acetone parallels the clinical condition and that abortion diminishes the production of acetone. The results are similar to starvation, but in pregnancy the demand for carbohydrate and consequently the disturbance following its lack, make it more intense than starvation. They have also stated that fluids are primarily indicated, with glucose occupying a secondary place. They do not see the need for salt injection or for insulin with the glucose in the majority of cases. Harding gives 1000 c.c. of 5 per cent glucose daily, together with enemata of 10 per cent glucose in saline.

Harding and Van Wyck reported a case in which the whole blood chloride content was 290 mg. per 100 c.c. and the CO_2 combining power 63 vol. per cent. After three days treatment the NaCl had risen to 412 and the CO_2 to 66. When the patient had received 6 gm. of NaCl per day for five days, the chlorides were 511 and the CO_2 dropped rather quickly to 48. They stated that small amounts of NaCl appeared in the urine before the chlorides reached 511, and thought it due to a lowered threshold. They concluded that whatever may be the exact significance of a lowered Cl content of the blood in vomiting of pregnancy, it certainly does not demand the use of hypertonic saline solution, as advocated by Haden and Guffey, in order to restore chemical equilibrium, and that the clinical condition of hyperemesis gravidarum is in no way dependent upon that particular balance of ions.

Titus and coworkers have treated their cases with larger amounts of intravenous glucose than any of the other men. They see no need for the use of insulin and, in fact, warn against its use. They give 50 to 75 gm. of glucose as a 25 per cent solution one to three times daily.

Haden and Guffey, in a case report of vomiting of pregnancy, found increased CO_2, N. P. N., urea, and uric acid, but low NaCl, and felt that their findings suggest that some at least of the toxemias of pregnancy are similar to the toxemia of intestinal obstruction. In such cases NaCl acts in a specific neutralizing antitoxin or protective capacity. They advise the use of 3 per cent saline solution subcutaneously.

Kerstein reports a case of pernicious vomiting which did not yield to glucose and bicarbonate solutions intravenously and by rectum but cleared up rapidly following the injection of 5 c.c. of 10 per cent NaCl intravenously and NaCl by mouth in large quantities. He states that vomiting of pregnancy resembles vomiting which occurs after x-ray therapy (in which he says there is a breakdown of large amounts of protein with resulting decline in per cent of NaCl in the system). This deficiency in early pregnancy is associated with hyperemesis, just as in the later months there is an excess of NaCl associated with edema.

Thalheimer has reported on the treatment of vomiting of pregnancy with glucose and insulin and states that the glucose and insulin are to oxidize the ketone bodies.

TABLE I

SERIES	DATE	TREATMENT	MILD		MODERATE		SEVERE		TOTAL CASES	TOTAL THERAPEUTIC ABORTIONS	PER CENT OF ABORTIONS	DEATHS
			CASES	ABORTIONS	CASES	ABORTIONS	CASES	ABORTIONS				
I	1916 to 1921	Nutrient enemata, salt and bicarbonate solution subcutaneously and intravenously.	2	0	7	4	2	2	11	6	54	A 1
II	1921 to 1924	Intravenous glucose, subcutaneous saline, nasal tube, glucose enemata	7	0	5	0	3	0	15	0	0	B 1 (SB)
III	1924 to 1927	Larger amounts of intravenous glucose and subcutaneous saline, nasal tube	13	0	14	0	6	0	33	0	0	C 1 (S)

This presupposes a marked acidosis, such as occurs in diabetes. He also states that he shortens the period of treatment days. He gives 1000 c.c. of 10 per cent glucose, or 2000 c.c. of 5 per cent glucose once daily, together with insulin subcutaneously.

In Table I we summarize the cases occurring on our service from 1916 to the present date, dividing them into three series, the first two of which were reported in 1924. Our classification is similar to that of Harding and Titus. Again, we would like to emphasize early and intensive treatment with hospitalization before the case is severe or pernicious. We believe that the value of our results is due to the fact that since 1923 practically all of the cases have been followed closely by one of us under the supervision of Dr. O. H. Schwarz, thus permitting the trial of a routine treatment in a large number of cases over a period of years. Since 1921, we have aborted no patient for vomiting of pregnancy, and yet we have treated forty-eight cases as compared to eleven in the previous period. To date, we have had three deaths, one occurring in each series. Protocols will be given later.

The blood chemistry in the mild series gave practically normal findings.

Table II gives the results in some of the moderately severe cases. It is unfortunate that the analyses are not all complete, but the results permit some theorization and probable conclusions.

Similarly, Table III gives results in certain cases of vomiting of pregnancy. Here the differences from the normal are decided and apparently we can use the blood findings as an aid in differentiating between neurotic (primarily desiring abortion) and toxemic, and in the latter case deciding as to whether they are only moderately severe or of the severe type.

Table IV gives the equivalent of the blood constituents in cubic centimeters of N/10 electrolyte per 100 c.c. plasma for some of our cases.

Similarly, Table V presents diagrammatically the total electrolytes as found normally, in pyloric obstruction, and before and after treatment in one of our cases.

We believe our results show:

1. That the production of a diuresis depends in all cases on the amount of fluid injected. 1000 or 2000 c.c. of fluid in twenty-four hours is insufficient.

2. A concentration of the blood as evidenced by decreased hemoglobin and cell volume percentages after fluids.

3. A plasma CO_2 content greater than 40 volumes per cent. In our previous series we found that the CO_2 content had been determined in seventeen cases and that the average was 55 volume per cent.

TABLE II

NUMBER	HOSPITAL DAYS	DAYS OF TREATMENT INTRAVENOUS GLUCOSE AND NASAL TUBE	WEIGHT KG.	FLUID INTAKE	URINE	HEMOGLOBIN PER CENT	CELL VOLUME PER CENT	PLASMA PROTEIN PER CENT	CO$_2$ VOLUME PER CENT CONTENT	P$_H$	NaCl MG. 100 C.C. WHOLE BLOOD P = PLASMA	N. P. N. MG./100 C.C.	URIC ACID MG./100 C.C.	BLOOD SUGAR MG./100 C.C.
B.C. 1159 Gr. II 8 weeks gestation	19	5	49.5 51.8	1500 4000 T-2800 1600 1900	? 2090 1490 1260 1190	66	43		51		445	20	3.4	104
H.K. 2209 Gr. I 8 weeks	11	5	50.0 50.0	2100 4300 T-1200 1075 1900	400 1550 1050 1100 1750	(1) 95 (5) 95	40.4 36.5		45 54		445 561	22 22	4.1 1.9	97 100
A.V. 5118 Gr. V 8 weeks	7	2		3000 T-4200	? ?	(1) 82	47	8.25	66 56	7.4 7.6	587 561	38 32	5.7	111 124
B.B. 5118 Gr. III 3 weeks	13 14	2 Private		1700 D-3900 D-2150 D-3370	440 1300 750 1000	66	35	5.68	58		510	26	2.6	124
R.C. 6338 Gr. II 7 weeks	16	2	54.5 52.2	2000 3800 D 2780	50 1130 930	(1) 90 (3) 90	36 38	5.9	35 45		528	35 23		85 126
M.T. 7006 Gr. I 9 weeks	8	1	51.7 50.9	1000	400	90	34	6.4			422	26		82

T=Nasal Tube.
D=Dry Diet.

4. A plasma P_H within normal limits or slightly on the alkaline side. We have never found it less than normal.

5. A decreased or borderline chloride content of the blood. Previously, chlorides had been determined by us only in one case (mild) and were decidedly low—43 mg. per 100 c.c. plasma.

6. A normal or occasional increase in N.P.N. and urea of the blood. In our previous series we found that the N.P.N. had been determined in ten cases, and was greater than 60 mg. per 100 c.c. blood in three.

7. An increase in the blood uric acid which is of no prognostic value and which rapidly returns to normal when a diuresis has been established.

8. A blood sugar within normal limits. Occasionally we found blood sugars of 0.070 per cent in which glycolysis had been prevented by immediate precipitation and determination; but the maintenance by the body in almost all conditions of a normal blood sugar nullifies any theory which assumes that the liver damage results in a hypoglycemia.

9. A decreased or borderline plasma protein content despite the concentration of the blood. We believe that in the severe type the plasma proteins have been utilized by the body and are, therefore, decreased, which phenomena presumably does occur in athrepsia, in which the blood proteins are low despite the desiccation.

10. A decrease or even absence of chlorides in the urine has been indicated by qualitative tests, and in a later paper we will give the results of quantitative determinations which prove this conclusion.

11. An increase in bile pigments of the blood, probably due to increased production and decreased excretion. (We have data only on a few cases, but apparently the icterus index is of considerable value in following the progress of the case.)

12. A decrease in the total electrolyte content of the blood.

13. A rapid gain in weight due to replacement of water.

DISCUSSION

After the hyperemesis has started the factors with their respective sequelae which have to be considered are: dehydration, starvation, and vomiting.

Dehydration results from the decreased or lack of water intake and also by inability to retain foods with their percentage of water. Another factor is the vomiting, which aids in depriving the body of fluid. Dehydration results in a concentrated viscous blood which naturally decreases the volume flow through all organs and tissues, thus decreasing the amount of food, water and oxygen carried to the cells and also permitting waste products to accumulate. Haden has reported increased viscosity of the blood following experimental intestinal obstruction. Keith deprived dogs of food and water and found a definite decrease in the amount of circulating blood and an increased viscosity of the whole blood. The plasma viscosity

TABLE III

NUMBER	HOSPITAL DAYS	DAYS OF TREATMENT. INTRAVENOUS GLUCOSE AND NASAL TUBE	WEIGHT KG.	FLUID INTAKE	URINE	VOMITUS	HEMOGLOBIN PER CENT	CELL VOLUME PER CENT	PLASMA PROTEIN PER CENT	CO_2 VOLUME PER CENT CONTENT	P_H	NaCl MG. 100 C.C. WHOLE BLOOD P = PLASMA	N.P.N. MG./100 C.C.	URIC ACID MG./100 C.C.	BLOOD SUGAR MG./100 C.C.	SPECIAL NOTES
J.F.	11	3		2850	620					(1) 48		416	91		236	Urea—51 mg.
5999				3600	750					(3) 65 +			53		193	
Gr. III				4600	975					(10) 60						
13 weeks				D + 1000	1200							533	15		108	
E.H.	13	4	(28)	1750	310					46		533	26		73	Rosenthal—14%—12% 4%. Moderate Impairment.
6154 and 6205			(29)	2600	400											
		(31)	– 57.2							62		616	23		172	
34 weeks			(30)	T – 2000	1010					66		633	22		114	
			(31)	T – 3400	1830											
Discharged		(11/12)	– 61.5		2500											11/17—Rosenthal—10%—8%—4%. Moderate Impairment.
Returned	36	(11/17)	– 56.3	1700	600					65		433				12/1—8%—4%—0%.
		2	(18)	T – 2400	1100											
Delivered		(12/1)	– 61.3													
(12/8)			(19)	D + 4000	1200											
			(20)	D + 4800	1800											
		(12/20)	– 55.5													
G.R.	8	2		1800	500		111	44		28		726	32	4.1	61	
2537				3570	2060											
Gr. IV				D + 885	695		83	33		54			27	2.4		
7 weeks																

TABLE III—CONT'D

NUMBER	HOSPITAL DAYS	DAYS OF TREATMENT INTRAVENOUS GLUCOSE AND NASAL TUBE	WEIGHT KG.	FLUID INTAKE	URINE	VOMITUS	HEMOGLOBIN PER CENT	CELL VOLUME PER CENT	PLASMA PROTEIN PER CENT	CO_2 VOLUME PER CENT CONTENT	P_H	NaCl MG. 100 C.C. WHOLE BLOOD P = PLASMA	N.P.N. MG./100 C.C.	URIC ACID MG./100 C.C.	BLOOD SUGAR MG./100 C.C.	SPECIAL NOTES
M.S.				2400	535		130	42		32		459	30	4.8	60	
2814	9	3		D + 2000	1500 +											
Gr. I			53.6	D + 1000	1130		91	36		36	7.50	480	22	2.3	110	
13 weeks																
F.B.			53.6	5000	610		111	45	5.9	57	7.45	495	50			Icterus Index
6633	14	3		5000	975											34
Gr. I				T − 910	830		90	36	5.3	58	7.42		27		92	Icterus Index
7 weeks			51.3													10
F.S.	24	5 (27)	----------	1500	960	+	86	34	5.9	53		380P	89	14.0	94	Icterus Index.
6576		(28)	61.7	2500	1000	250 +							Ur. 42		96	Rosenthal
Gr. I		(29)	----------	4000	650	250	90		5.9			347P	77			31 18—20—18
13 weeks				Drowsy	Lavage											Tetra-
		(30)	----------	T − 2900	850	500	95	30	6.2	53		413P	33	4.4		40 iodophenolphthalein.
		(Very (31)	----------	T − 3600	850	700	78	25		57			27			18
		Drowsy) (1)	----------	D − 530	350	+										21
		(2)	----------	D + 3600	350	+	75	30	5.1	53		413P	32			28
							68	25	5.3	53		396P	17		126	Liver Function
		(17)	57.2			(20)	−71	19	5.8	41		495	42		89	1st. hour 0
													Ur. 28			2nd. hour 0
																35 % Retention
																Creatinine 1.7

TABLE IV. EQUIVALENTS IN C.C. N/10 ELECTROLYTE PER 100 C.C. PLASMA

CASE	PROTEIN 1	CO_2 2	NaCl 3	HPO_4 4	ORGANIC ACID SO_4 (6-5)	TOTAL ACID 1+2+3+4 5	TOTAL BASE 6	EXCESS UREA AS ELECTROLYTE HARTMANN	TOTAL ACID + UREA
X	10-13.5	22-31	100-110	1.5-3	(20)	135-155	147-167		
Wo	17-20								
A.	(17.1)	19	76			118.1			
H.K.				( )	( )				
2209									
D.	(17.1)	21.3	91.1			140.2			
A.	(17.1)	20.3	71			114.4		11.7	126.1
J.F.									
5999									
D.	(17.1)	25.4	91.1			139.6			
A.	16.9	24.1	84.6			131.6		4.4	136.0
F.B.									
6633									
D.	16.5	24.6	(100)			147			
A.	16.9	22.5	64.9			110.3		11.4	121.7
F.S.									
6576									
3 days later	17.7	22.5	70.6			116.8			
Ante-mortem	16.7	17.4	84.6			124.7		3.0	127.7

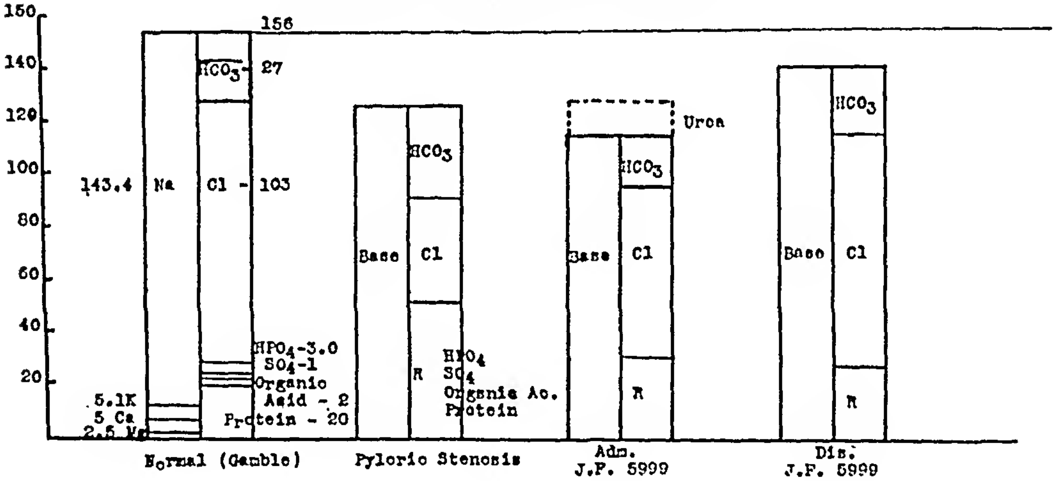
X=Peters-Bulger, et al. Normal nonpregnant.
( )=not determined—assumed normal.
A.=Admission. D.=Discharge.

was variable. Utheim in anhydremic babies has found a decrease in the volume per minute flow of blood through an extremity. Just how much of the increased N.P.N., uric acid, etc., is due to dehydration is difficult to determine now. Formerly, it was thought that that was the only factor, but now other theories have been advanced to account for the retention of N.P.N.

In 1907, Ewing reported that at autopsy of cases of pernicious vomiting he found the intestinal tract distended with saline solution which had failed to absorb any of the fluid. In two cases the blood was found remarkably thick, viscous and cohesive to an extent which he had never seen in any other condition, and which must have been of itself dangerous to life. These conditions, he thought, indicate that saline infusion is required in the severe stages of hyperemesis or acute yellow atrophy, both to eliminate the poisons and to maintain the normal concentration of the blood, and that saline irrigation cannot be relied upon in a patient who is incapable of absorbing fluids. Why was the fluid not absorbed? In Series I the patients were given normal saline solution and $NaHCO_3$ subcutaneously, intravenously and by rectum, and although Harding reports that fluids are of primary importance, these patients did not clear up and 56 per cent were aborted. It is significant that Harding is still using glucose as the solute in his fluid.

TABLE V

C.C. N/10 Electrolyte per 100 c.c. Plasma.



Benedict and Milner found that if the same person were given identical amounts of water and caloric equivalents of food he would gain 165 grams daily if the diet were mainly carbohydrate; but would lose 906 grams daily if the diet were chiefly fat. They concluded that body water is held largely by carbohydrate. The experiments of Gouin and Andouard also show that in animal tissues the H_2O content is much greater after feeding with sugar than before. Bishop and Voit demonstrated that a large loss of body water occurs when an abundant carbohydrate diet is changed to a fat and protein diet (which occurs in starvation). The experiments of Adolph on water metabolism indicate to him that there is no regular H_2O reserve, as stated by other authors, but that the circulatory H_2O is kept constant even at the expense of tissue structure, just as amino acids and glucose are kept constant during starvation. He finds that 3500 to 4000 c.c. of fluid can be lost rapidly, but regained just as quickly providing the body salts have not been decreased. In the event of the latter having occurred, water will not be retained until the salts have been replaced. He notes that the removal of 3500 c.c. of fluid results in a 10 per cent increase in hemoglobin.

TABLE VI

CASE	OXYGEN CAPACITY PER CENT	CELL VOLUME PER CENT	PLASMA							WHOLE N.P.N. MG./100 C.C.	P_H
			PROTEIN PER CENT	CO_2 PER CENT VOLUME	NaCl MG. 100 C.C.	INORGANIC P. MG./100 C.C.	TOTAL ACID mM	TOTAL BASE mM	ORGANIC ACID mM		
18406	15.3	40.6	6.35s	61.9	556	2.7	133.3	145.1	11.8	36	
7 days later	15.3	35.9	5.96s	61.4	580	3.5	137.4	158.1	20.7	23	
26515	17.0	34.7	6.3	53.2	465		116.0			40	7.54
*35556				30.6	619						
				26.6	615	2.4	132.4	135.6	3.2	42	

*Rosenthal liver function test showed 10 per cent at end of ninety minutes, indicating considerable impairment of liver. Patient had therapeutic abortion. Courtesy Peters, Bulger, et al.

Gamble and coworkers in a study of the metabolism of fixed base during starvation summarized as follows: Body water is lost during fasting in consequence of two events—the destruction of protoplasm with release of its water content, and a reduction in tissue glycogen causing a decrease in cell volume. They also found a marked excretion of calcium in the urine which must come from bone, and in the blood a marked decrease in chlorides and a reduction of $NaHCO_3$ which is roughly proportioned to the degree of ketone acid production. They found that as the fast progressed the urine became almost chloride free, but that on resumption of carbohydrate diet the base chloride of the blood increased, and this suggests very definitely that reduced base chloride during fasting is due to an altered distribution rather than to an absolute depletion of the chloride content of the body water. Thus, the depletion or absence of glycogen in vomiting of pregnancy may, in part, explain the failure to retain fluids. During this period the fetus is still growing rapidly, as a parasite, and using primarily glucose.

The *vomiting* naturally results in decreased fluid intake but the severity of the case depends on the amount of body fluid vomited. In the stomach hydrochloric acid is excreted. The H-ion is obtained from H_2CO_3 of the blood, while the Cl-ion is obtained from the NaCl. The HCO_3 in the blood combines with the Na, giving $NaHCO_3$, and the result is an increase in the CO_2 combining power, thus accounting for the normal alkaline tide following meals. Normally, Cl is reabsorbed in the intestine, but if it is excreted there will soon be an excess of $NaHCO_3$ in the blood and the patient will have an uncompensated CO_2 excess. If the patient is able to compensate by keeping the P_H normal, there will be no tetany, but if the P_H is increased, tetany is likely to occur. It follows that vomiting depletes the body chlorides and Lim and Ni have shown that in dogs the gastric glands will secrete HCl despite a low blood chloride content, thus indicating not only the urgency for stopping the vomiting, but also the danger of repeated gastric lavage in these cases.

Denis and von Meysenburg have shown that gastric tetany and tetany following excessive $NaHCO_3$ ingestion are due to an abnormal $H_2CO_3/NaHCO_3$ ratio and not to an abnormal ratio between Na and Cl. Vomiting removes HCl and some NaCl from the body in addition to its dehydrating effect. The result is a decrease in Cl and an increase in $NaHCO_3$. Other factors enter; for example, a portion of the $NaHCO_3$ (which may amount to one-third of the normal content) is used to neutralize ketone acids, some of the base is lost in urine, etc. The blood electrolytes tend to be constant, not only to keep the acid-base equilibrium, but also to keep the osmotic pressure of the blood and tissue fluid normal. That they fail in this in some cases has been demonstrated. Murray reports a case of pyloric obstruction and tetany in which the freezing point and also the specific conductivity of the serum were lowered, demonstrating that the electrolytes were decreased. Feltz and Murray noted while determining electrocardiograms in dogs with pyloric stenosis, that the resistance of the tissues between the electrodes after salt solution was allowed to soak the skin until no further decrease occurred was over three times as great in dogs after operation. McCullough noticed similar phenomena while determining electrocardiograms on athreptic babies and believes the increased resistance was due to lack of water in the subcutaneous tissue.

The increase in N.P.N. in upper intestinal obstruction has been attributed by Haden to excessive protein catabolism caused by a toxin produced in the blocked intestine; by Feltz and Murray to the high $NaHCO_3$ content of the blood and the possible effect of the change caused by it on the kidneys; by Utheim and Marriott to decreased blood flow through the kidneys, and by Hartmann to a retention by the body to keep up the osmotic pressure. The latter has noted that base carbonate may possibly be excreted in the urine during periods of uncompensated alkalosis, and it is in these cases with low total electrolytes that the highest values for N.P.N. are usually found. He advances the theory that if the excess urea is calculated in terms of N/10 electrolyte, and added to total electrolyte, the sum will be approximately normal. He further finds that when the total amount of electrolyte plus the equivalent of retained N.P.N. exceeds the normal, bicarbonate is excreted in high concentration, sufficient to make the urine very alkaline, and chloride appears for the first time in the urine. At such a time also the blood N.P.N. falls to normal or near normal value. Hartmann, in a personal communication, states that freezing point determinations in several cases in spite of lowered total electrolytes are normal, thus indicating normal osmotic relations. Likewise, with total base determinations the results have confirmed the above outlined theory, provided that the excess urea was taken into account. A nephritis or nephrosis has been suspected by some authors, but despite the presence of casts, albumin and lowered phthalein output, the speed with which these cases clear up would preclude any disease of the kidney. Autopsies on anhydremic children reported by Mitchell, Marriott, and others, who had high N.P.N., and adults dying following obstruction, and on animals with obstruction have usually demonstrated little or no renal pathology.

Experimentally in animals it has been shown by McCann, MacCallum, Hastings and coworkers, Haden and Orr, Gamble, Murray and others, that with closure of the cardia or pylorus the CO_2 combining power increases, the chlorides decrease, and the urea increases. The animals after several days usually showed muscular twitchings, tremors and spasticity, and in some cases, death. Determinations of CO_2 combining power and P_H at this period almost invariably demonstrated an alkalosis. The animal's period of life was increased markedly by the administration of NaCl solution. Haden and Orr believe that in the obstructed viscus (stomach or intestinal loop) a toxin (the proteose described by Whipple and Brooks with their respective coworkers) is formed, which is neutralized in the tissues by the HCl and that the beneficial effect of NaCl is due to the increase in Cl-ions. They thought that the increased blood nonprotein nitrogen encountered was explained by increased protein catabolism caused by this toxic agent. It has been found, however, that in obstruction with no vomiting, e.g., rabbits cannot vomit, but if the pylorus is obstructed the stomach becomes distended with fluid; or if the stomach is lavaged repeatedly, the excreted Cl-ions are more than enough to account for the decrease of this ion in the plasma. Furthermore, the concentration of nitrogen begins on the second or third day before the animals evidence any marked signs of toxemia and before the kidneys show albumin and casts.

Clinically, Gamble, Broun and coworkers, Ellis, Haden and Orr, Murray and others, have found in high obstruction (pyloric or duodenal) an increased CO_2 combining power, increased N.P.N., and decreased NaCl. Hartmann has reported similar findings in infants and children with pyloric or intestinal obstruction, upper intestinal fistulas and vomiting accompanying disease elsewhere in the body.

It is unfortunate that the total base of the serum was not calculated. In a careful study of total acid-base equilibrium of plasma in various diseases, Peters, Bulger and coworkers, included three cases of vomiting of pregnancy. Their report is best represented by Table VI. Case 18406 of their series is of decided interest. She had had her first pregnancy terminated in 1923 at eight months gestation on account of a blood pressure of 200/140. The blood pressure gradually dropped to 150/100. She never had had an increased N.P.N. While under observation the blood pressure gradually rose and in 1925 the patient returned complaining of severe headaches, scanty urine and morning sickness. As vomiting increased she became drowsy and at times had attacks of breathlessness during which she had spasms of hands and feet, which at times involved the entire extremities. Her blood pressure was 230/135. The urine contained a trace of albumin and hyaline casts. The diagnosis was typical of tetany, but how many of us would have called it eclampsia? They concluded that there was dehydration, lowered chlorides, probably due to loss in the vomitus, and normal bicarbonate (high for pregnancy, we think), and the total base was decreased. They also noted that during seven days treatment the patient received 20,800 c.c. of H_2O but only voided 9,270 c.c. retaining, presumably, 11,500 c.c. Salt was also retained in large amounts, thus showing that she had had an excessive loss of these elements during the preceding period. They state that if the defense of the body against the alkalosis of over-ventilation lies in the replacement of HCO_3 by chloride, the cause of tetany in this case is as follows: With the Cl depleted by vomiting, compensation could not be effected, consequently over-ventilation of a grade that reduced bicarbonate only to normal level resulted in the development of true tetanic spasms. They conclude that vomiting depletes the plasma chlorides and that mild over-ventilation then can produce tetany. They also state that, "the effects of vomiting on the electrolytes of the serum are highly variable and probably depend on the nature of the vomitus, the severity and duration of the emesis, and the degree of inaction produced. The most frequent result is a reduction of chloride, with or without a diminution of base. The level of bicarbonate is capricious. Vomiting of hydrochloric acid is not essential for the production of this picture, as it has been encountered in a patient with esophageal obstruction who had not vomited." They believe that any given disturbance of electrolyte equilibrium will evoke a train of reactions and changes in all of the other electrolytes, but that these always tend to restore equilibrium.

We have used the Rosenthal phenoltetrachlorphthalein test for liver function and have found it showed retention, at times marked, in cases of vomiting of pregnancy. However, the tests usually become normal very quickly, and we have felt that the test runs parallel to the glycogen content of the liver, that is, if the patient is tested on admission, when presumably the liver is depleted of glycogen and filled with fat the dye will be retained, whereas, in two or three days it will be excreted normally. We have found that in those patients who desire abortion the test remains normal.

In this series we did not determine the ketone bodies in the urine, but qualitatively they give no index as to the severity. As starvation continues they do not increase progressively but reach a maximum in five or six days and then gradually decrease.

The following protocols indicate that one death was caused by sepsis following therapeutic abortion, and that the other two were, we believe, due to pathologic physicochemical changes produced in the body cells by the long period of vomiting and starvation.

(*A*) Was due to a Streptococcus hemolyticus septicemia following therapeutic abortion.

(*B*) S. B., thirty years old, gravida i, seventeen weeks gestation. Vomiting for three months. She has retained nothing for the past two or three weeks and has lost 15 to 18 pounds. She has been confined to bed for the last two weeks. Does not have jaundice. Has been irrational for one week.

Examination.—She was markedly dehydrated and emaciated. Blood pressure was 100/65, pulse 130, temperature normal. Nystagmoid movements of eyes. All reflexes present and active. Suggestion of Babinski on right. Memory was defective and speech was incoherent at times. Neurologists stated that patient had an exhaustion psychosis. Urine showed a faintly positive nitroprusside and negative $FeCl_3$. N.P. N. of 29.4 mg/100 c.c. Uric acid of 6.1 mg./100 c.c. Co_2 content was 50 volume per cent. Despite fluids (probably insufficient in quantity) and nasal tube the patient died four days after admission, with symptoms and signs of a peritonitis.

Autopsy Diagnosis.—Encephalitis, acute (hemorrhagic,) enteritis, proctitis.

(*C*) F. S., Case 6576 had been vomiting for seven weeks, more marked the last four weeks. On admission patient was found to be listless, had icteric sclerae, and nystagmoid movements of eyes. Blood pressure 80/40, pulse 125, normal temperature. Her uterus was the size of a 12 to 14 weeks gestation. Urine showed faint nitroprusside on admission but was negative thereafter. Reaction was acid to litmus for two days and then became alkaline until two days before death. Vomiting never ceased entirely and the amount of food eaten was always small. About twelve days after admission patient showed definite pathologic changes which were as follows.—The patient was drowsy, irrational, and memory for recent events was poor. Nystagmoid movements of eyes, unable to converge, diplopia on close vision. Slight facial weakness on right. Knee and ankle reflexes absent. Arm reflexes doubtful. Plantar reflexes normal. All muscles of lower extremities were tender. Jaundice, which had decreased, again became marked. Patient began to have a temperature of 39 to 40° C. four days before death from no demonstrable cause. Spontaneous abortion three days later followed by dilatation and curettage for retained secundines. Death occurred twenty-four hours later.

Autopsy.—Nothing found to account for death. Section of brain and cord with special stain not completed.

In Cases B. and C. we feel that the abortion was a terminal process. In a review of the postmortem findings on both bodies Dr. McJunkin, of the Department of Pathology, states that the slight edema of the brain cannot be regarded with any importance. He states that the autopsies were negative so far as finding any pathology sufficient to cause death.

We are indebted to Dr. A. B. Jones of the Neurologic Department for the following note. The central nervous system *symptoms and signs* noted in these cases are accompaniments of disease elsewhere in the body. There is no pathology demonstrable in the brain or cord. Adolph Meyer speaks of these conditions as dyscrasias and believes them due to a deranged metabolism caused by exogenous or endogenous toxins. In the latter they accompany or follow the disease, which may be vomiting of pregnancy, heart, liver or kidney disease, *pneumonia, typhoid,* etc. The prognosis is worse and the mortality higher if they occur with the disease rather than subsequently. They are characterized by disorders of orientation, confusion, illusion, delusions, hallucinations; by states of anxiety and apprehension, and lastly, poor retention memory. They have no relation to Korsakoff's syndrome.

J. P. Gardiner in a discussion of Titus' paper stated the following.—"From the postmortem examinations of two cases which I was able to study for sometime, I found the pathologic picture the same as Adami described in fatal cases of inanition. In pernicious vomiting of pregnancy the patients do not die of the original cause. Most of them have been vomiting from three to six weeks. The evidence tends to show that they die primarily of starvation and dehydration. One of the patients, who had been unable to retain anything in her stomach for six weeks previously, was kept alive for twenty-nine days by the administration of 10 per cent glucose solution in 1000 c.c. of physiologic sodium chlorid solution, given as often as symptoms demanded. The cause of pernicious vomiting must be studied further." As to the cause of death in these patients who have been vomiting over a long period of time, that is, have had a long period of semi-starvation, we believe the following facts, which have been observed both in humans and animals, give some clues.

Loeb demonstrated in the lemulus that the Cl-ion has a specific place in the body and cannot be replaced, and that a simple addition of NaCl will neutralize toxic effects produced by other ions; for example, NaBr, Na_2SO_4, $NaNO_3$, etc. Haden and Orr have also shown that the administration of KCl, NH_4Cl, $CaCl_2$, $MgCl_2$, KI, $MgSO_4$, and many other salts in cases of obstruction with lowered NaCl have not only been of no avail, but have actually been harmful.

Rubner noted in starvation that an animal can lose practically all of its fat and glycogen and half of its body protein (approximately 40 per cent of its body weight) and still live; whereas the loss of 10 per cent of water content of the body results in serious disorders, and the loss of from 20 to 22 per cent results in death.

Marriott finds that in athreptic babies, if the condition has persisted too long, nothing will prevent death, and yet autopsy reveals little or no pathology. Lusk states that after chronic inanition extending over a considerable period of time on high carbohydrate and low protein, as occurs in famines, certain individuals will die despite the use of a balanced diet. Rubner states that this condition does not occur in fasting dogs and concludes that the acute road of starvation yields a sufficient amount of protein metabolism.

Shol states that animals if placed on a balanced diet will die in four to six weeks if one of the body salts is lacking. On a salt poor diet the animals showed stupidity, loss of interest, trembling, muscle weakness, paralysis of the hind legs, and finally convulsions. Taylor found that if the diet which he took was salt free but kept him in nitrogen balance, acetonuria developed on the ninth day and also muscle soreness. Joslin repeated the experiment, with similar results, and noted that he lost 2.5 kg. in the first three days and 2.5 kg. more in the next ten days, but on a complete diet he gained 4.5 kg. in the first seventy-two hours.

In our two cases, in Gardiner's, and probably in many others, do we not find death following relatively long periods during which the food intake is minimal, the nitrogen balance usually negative, the base balance negative, and insufficient amounts of water ingested? In F. S. (6576), despite the large amounts of NaCl given subcutaneously and ingested in the regular diet, the blood chlorides were never normal, nor did the total electrolyte content approach normal. The marked decrease in hemoglobin and cell volume also demonstrate the profound changes in metabolism which had occurred and indicate that transfusion should be of value in these cases.

Our mild cases are characterized by:

1. Intermittent nausea and vomiting which is marked enough to prevent gain in weight, or even slight loss. Water or some type of fluid is retained.
2. Ketonuria.
3. Normal blood and urine analyses (except for ketonuria).

At present the only distinction which we can make between moderately severe and severe is that of degree. They are characterized by:

1. Ejection of body fluids in the severe as compared in the moderate, with vomiting only after eating or drinking.
2. Ketonuria marked, or at times absent.
3. Concentration of urine with its attendant effects.
4. Changes in constituents of the blood as already outlined.
5. Dehydration.
6. Normal or elevated temperature, pulse, etc.
7. Increased bile pigments or clinical jaundice.

The mild cases are treated by a high carbohydrate diet of solid food at frequent intervals, with liquids between feedings, with midnight and early morning lunches in addition. Luminal as a sedative is given by mouth. The bowels are regulated and any nose or throat disturbance is treated. Dilute hydrochloric acid in 0.6 to 1.00 c.c. doses, three or four times daily, has been found more efficacious than $NaHCO_3$. We believe that time is saved by treating intensively all cases where vomiting is marked. The plan which we follow rather closely is as follows:

(A) 1. Nothing by mouth for forty-eight hours.

2. Daily enema.

3. Luminal sodium 0.12 q 6 hours day and night (remembering that the drug subcutaneously only demonstrates its hypnotic effect in eight to twelve hours).

4. Normal saline, or better, Ringer's solution, 1000 to 1500 c.c. twice daily.

5. Intravenous glucose, 10 per cent solution, 1000 c.c. three times daily, or 1500 c.c. twice daily. Occasionally 500 to 1000 c.c. of 20 per cent glucose are used two or three times daily.

6. Use of 5 to 6 gm. NaBr in starch water given by rectal tap once or twice daily, until the luminal has had time to act.

B. 1. Insertion of the Andrew's nasal tube for forty-eight hours or more. Fig. 1. (This tube does not enter the duodenum.)

2. Injection of 10 per cent Karo syrup with 2 to 5 per cent Dryco or skimmed milk, beginning with 50 c.c. q one hour, and increasing up to patient's tolerance (usually the maximum is 300 c.c. one hour). The concentration of Karo may have to be decreased if glycosuria or diarrhea ensue. Skimmed lactic acid milk or buttermilk are probably better than Dryco, and are now being used by us.

3. The use of luminal through the tube instead of luminal sodium hypodermically.

(C) Removal of the tube and beginning of dry diet which consists of cereals, toast, crackers, potatoes, lean meats, etc., from 6 A.M. to 8 P.M., with midnight and early morning feeding. Patients to receive fluids (fruit juices, etc.) in intervals. This diet is gradually increased, but midnight and early morning feedings are continued throughout pregnancy. Fat ingestion is always kept low.

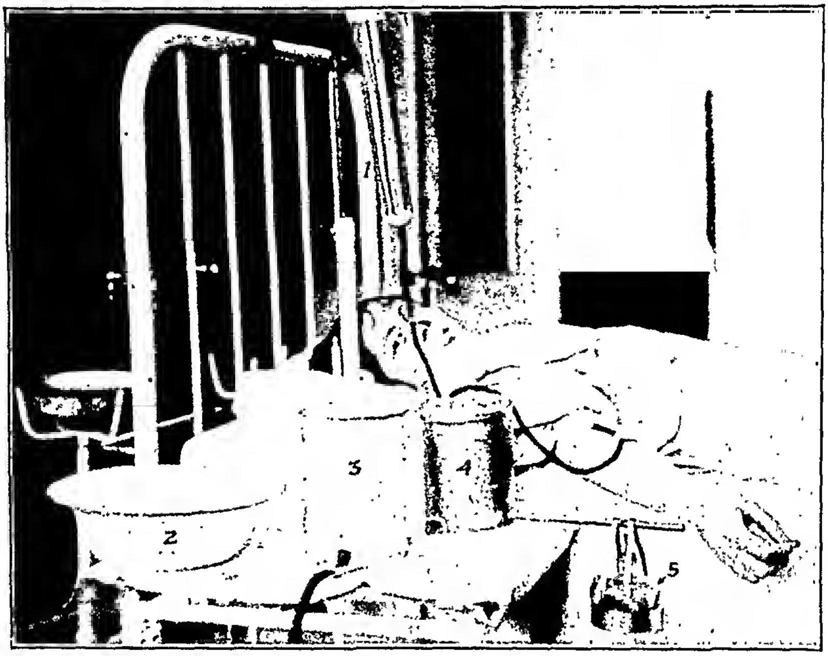


Fig. 1.—(1) Salvarsan flask. (2) Basin of hot water and thermometer. (3) Enema can, similarly equipped. (4) Dale water bath. (5) Alcohol burner.

The important points are the initial fast (the stomach is rested), sedatives (the patients are nervous, have not been sleeping, and if asleep do not vomit), the saturation of the body with water, glucose and salts, and the early use of a general diet. Normally, one requires 3500 to 4500 c.c. of fluid in twenty-four hours. Consequently, we believe these patients should have 5000 to 6000 c.c. per twenty-four hours, until the fluid content of the body is normal. The introduction of the amounts of glucose outlined can be given with no fear of danger, providing the following rules, as previously reported by us, have been fulfilled.

1. Any C. P. grade of glucose can be used. We have used Merck's

and Mallinckrodt's Dextrose. There is no need for the anhydrous which will give clearer solutions but costs three or four times as much.

2. Freshly distilled water (must be used the day of distillation, or sterilized immediately after distillation and kept sterile).

Since 1923 we have been using only water distilled on the same day. It was recognized in 1915 that the fever which occasionally followed salvarsan injections was due to dirty water, but it was not until Seibert's work proved that distilled water if not sterilized and kept sterile will, within forty-eight hours, contain a pyrogen resulting from bacterial growth, which will cause chills and fever if injected.

3. Proper sterilization and subsequent maintenance of sterility. We prefer the autoclave for thirty minutes at 15 pounds pressure. Caramelization is no contraindication to injection (Erlanger and Gasser). The solutions can be kept indefinitely provided they have been sealed. The P_H of the solution is between 5 and 6.5, but so little alkali is required to bring it to a P_H of 7.4 that there is no need for buffering glucose solutions, as recommended by Williams and Swett.

4. Chemically clean infusion apparatus (it is not boiled in the same sterilizer with pus basins, etc.). We prefer sterilization by the autoclave.

5. Proper observance of temperature during administration. (A solution below 37° or above 45° C. will almost invariably result in a reaction.)

6. A calculated rate of injection. We usually take sixty to ninety minutes to give 100 gm. of glucose, and two to three hours for 200 gm. This can be repeated every four to six hours without glycosuria.

Fig. 2 shows the type of apparatus and method used for intravenous injection. It is not complicated or expensive. More elaborate methods for both the preparation and administration have been published, but if the above outlined program is followed, whether in hospital, doctor's office, or in the home, there will be no ill effects from intravenous glucose injection.

We have used insulin in only a few cases, although the first case of vomiting of pregnancy treated with insulin and glucose (at the suggestion of Dr. O. H. Schwarz) was reported from our clinic. The few cases in which we used it were patients in whom we wished to give 200 gm. or more of glucose at one injection. We have felt as Titus, that is, that using insulin with glucose was similar to pouring oil on the fire. In those cases in which it was used, we advised mixing it with the glucose. If there was a marked acidosis (as Thalheimer suggests) due to ketone acids, as in diabetes, insulin with the glucose would be indicated, but we do not find that here. It is well known, however, that glucose tolerance curves after prolonged fasting show markedly increased blood sugars and prolonged rises (i.e., the curves approach the diabetic curve). We have done sugar tolerance tests on some of our patients and they do show more prolonged effects than a two or three day fast will show. Presumably the diabetic tendency is due to a delayed production of insulin by the pancreas. If so, insulin is indicated. Once the body has started assimilating glucose, however, there is no further trouble. Therefore, we advise a slow and careful initial injection so that the pancreas can have sufficient time to produce insulin.

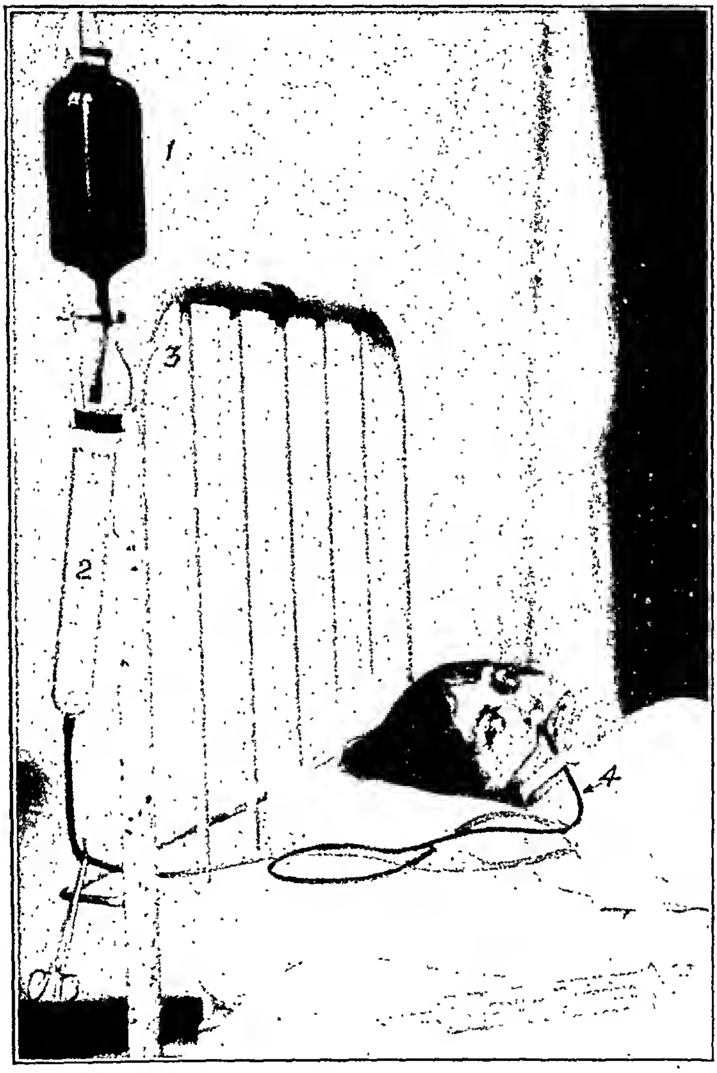


Fig. 2.—(1) Bottle for stock solution. (2) Salvarsan flask for measuring. (3) Funnel for air vent and also for medication. (4) Nasal tube.

The objections to the use of insulin are as follows: Titus quotes McCloud, who states that "insulin causes the sugar of the blood (and tissues) to diminish in both the normal and diabetic animal, partly because of an increase in the relative amount of carbohydrate that is metabolized and partly because some of the glucose is converted into a nonsaccharine material, which is mainly glycogen in diabetes but some other substance in the normal animal. In the latter case insulin actually causes the glycogen stores to become depleted because of the demand for glucose which is set up, partly to form this unknown substance and partly to be oxidized." They offer the following simile, "injection of glucose alone is like supplying fuel to a furnace which has burned low, at the same time storing some in the fuel bin; whereas, to add insulin to the glucose is like pouring kerosene on the coal to make it burn faster, and the result might be a conflagration, as some recent work indicates." Andrews finds that in experimental dehydration the hypoglycemia produced by insulin is intensified as to degree and prolonged as to time. Drabkin and Shilkrit noted in dogs desiccated through water starvation that injection of insulin increased the anhydremia, that convulsions did not occur when hypoglycemia had developed, and, most important, that glucose injection would not prevent death in the dehydrated animal when a hypoglycemia had been produced. Therefore, if insulin is used, we urge that it be mixed with the glucose solution in the ratio of 1 unit of insulin to 3 gm. of glucose; thus, if for any reason the venielysis should be interrupted and difficulty be encountered in reintroducing the needle, sufficient glucose will have been injected with the insulin to prevent a hypoglycemic reaction.

On the other hand, it has been demonstrated that in normal subjects insulin and glucose spare proteins more than glucose alone. Lawrence, in a recent publication, concludes that insulin causes, primarily, glycogen storage (subject was a diabetic). Campbell and MacLeod believe that normally insulin does not increase metabolism until the hypoglycemia with convulsions, etc., raise it. Kelloway and Hughes showed that after insulin injection the disappearing blood sugar could not be accounted for by a corresponding rise in oxygen consumption, nor CO_2 of calorific production. Best, Hoet et al., have apparently proved conclusively that insulin changes blood sugar to glycogen. To summarize, if insulin in the normal subject changes glucose to glycogen without any ill effect, it is worthy of trial in vomiting of pregnancy with doses of glucose greater than 100 gm., but it is not only not necessary but, we believe, potentially dangerous if used with 100 gm. of glucose or less.

The use of 100 to 200 gm. of glucose intravenously at one injection will be questioned by some. Ohler and others have stated that large amounts of glucose intravenously may change a potential diabetic into a real one. They state that Allen reported that following removal of a portion of the pancreas of a dog he could, with a large amount of carbohydrate, produce a true diabetes. Careful analysis of Allen's work, however, shows that practically all of the pancreas had to be removed before this could be done. Furthermore, we have been using these amounts since 1923 without any ill effects. Woodyatt states that the normal tolerance for glucose intravenously is 0.85 gm.

per kg. per hour for a *continuous* infusion extending over hours, and although we exceed the continuous tolerance limit we have found that by giving 100 gm. in 60 to 90 minutes and not repeating for four to six hours our patients do not, as a rule, show a glycosuria. Those that did never excreted more than 13 gm. in the first twelve hours, and none thereafter. Some of the patients have been seen after an elapse of two to three years and have shown no demonstrable ill effect, nor have we been able to demonstrate by glucose tolerance tests any decreased carbohydrate tolerance.

Any solution intended for intravenous administration should be made up either by the doctor himself or by a person who has had personal supervision. No doctor would permit his office girl or technician to make up his salvarsan solution, and yet in hospitals any one is considered able to make up glucose and saline solutions, and usually it is considered a matter of little importance and the youngest nurse has this job. If the solutions put up by the operating room or drug room force in first-class hospitals are analyzed, one will find some queer results. Since 1923 all of the glucose solutions used on our service have been made by one of us, or by a technician trained by one of us. The graduates, flasks for mixing, and pyrex flask containers are used for nothing but glucose solution. Thus, one will not have any contamination as has been reported of camphor, etc., nor will one have the opportunity of injecting distilled water, as has been reported, with fatalities in both cases. We have had no deaths, nor have we had any severe reactions. For the last two years the interns have been administering the glucose and the rare reactions obtained (slight chill or temperature elevation of 1 to 20) have been due to faulty technic in injecting it.

As a digression, to show the relatively tremendous amount of glucose used by us we have included the following report which shows that from July 1, 1924, to Jan. 1, 1927, we have made up and administered the following glucose solutions to obstetric patients for vomiting of pregnancy, puerperal peritonitis, toxemias, shock, etc., 132 liters of 20 per cent, 249 liters of 10 per cent, and 19 liters of 5.1 per cent (approximately isotonic), a total of 400 liters or approximately 118 gallons.

CONCLUSIONS

1. Vomiting of pregnancy is due to a deranged metabolism of the maternal organism, particularly of the carbohydrates.

2. The pathologic urine and blood analysis and the signs and symptoms of the patient are results of the vomiting, starvation, and dehydration.

3. Severe vomiting of pregnancy is characterized by normal or increased CO_2, P_H, and N.P.N., and by low normal or decreased NaCl and plasma protein.

4. Alkalies in the treatment are not only not indicated, but are actually dangerous, for there is either a normal acid-base balance, a compensated alkali excess (normal P_H and high CO_2), or a compensated alkali deficit (normal P_H with a low CO_2). The latter finding is rare.

5. Vomiting of pregnancy is treated by supplying the deficiencies; that is, food, fluid, and salts.

6. A general plan is outlined, but each case must be individualized.

7. There is no danger from intravenous glucose providing the tenets outlined by us are obeyed.

8. Experimental work indicates that insulin with intravenous glucose restores glycogen stores much more quickly than intravenous glucose alone and, if true, insulin with large amounts of glucose may give better results than glucose alone.

9. Long periods of vomiting and semistarvation produce changes in the body which will cause death and yet autopsies will reveal no demonstrable pathology. Death may be due to pathologic physicochemical changes in the body cells.

10. Our results in a series of forty-eight cases since 1921, with none requiring abortion, show that the treatment of this condition has been greatly changed since the continuous use of large amounts of intravenous glucose solutions have proved so successful.

11. We believe that systematic study of the metabolism in general, and particularly of the carbohydrates, together with a study of the acid-base balance of the body will enlighten us more as to the etiology, pathology, and treatment than speculations concerning "toxins" or deranged glandular function.

REFERENCES

Adolph: Jour. Physiol., 1921, lv, 114. *Allen, F. M.:* Glycosuria and Diabetes, Harvard University Press. *Alvarez, W.:* The Mechanics of the Digestive Tract, 1922, B. B. Hoeber, New York City. *Andrews:* Arch. Int. Med., 1926, xxxvii, 82. *Andrews, R.:* Proc. Med. Soc. Wash. Univ. School of Med., Feb. 2, 1924, Reported in Jour. Mo. State Med. Assn., 1924, xxi, 129. *Arzt, F.:* AM. JOUR. OBST. AND GYNEC., 1926, xii, 879. *Bar:* Lecans de Pathologie Obst., 1910, xi, 271. *Benedict, F. G., and Milner, E.:* U. S. Dept. Agriculture Bull., 1907, clxxv, 226. *Best, Hoet and Marks:* Proc. Roy. Soc., B. C., 1926, xxxii. *Bliss, S.:* Jour. Biol. Chem., 1926, lxvii, 109. *Brooks, Schumacher, and Wattenberg:* Ann. Surg., 1918, xxxvii, 211. *Campbell and MacLeod:* Medicine, 1924, Baltimore, iii, 195. *Cook, F. and Osman, A.:* Grey's Hosp. Rep., April, 1923, p. 223. *Cook, J. V., Rodenbaugh, F., and Whipple, G.:* Jour. Exp. Med., 1916, xxiii, 717. *Copher, G. and Brooks, B.:* Ann. Surg., 1923, lxxviii, 755. *Dennis and von Meysenberg:* Jour. Biol. Chem., 1923, lvii, 47. *Dieckmann, W. J., and Krebs, O. S.:* Jour. Mo. State Med. Assn., 1924, xxi, 335. *Dieckmann, W. J., and Kinsey, J.:* Am. Jour. Nursing, June, 1925. *Drabkin and Shilkrit:* Proc. Soc. Exp. Biol. and Med., 1924-25, xxii, 369. *Ellis, A.:* Quart. Jour. Med., 1924, xvii, 405. *Erlanger, J., and Gasser, H.:* Ann. Surg., 1919, lxix, 389. *Ewing:* Am. Jour. Obst., 1905, xxi, 145. *Ewing:* Am. Jour. Med. Sc., 1910, cxxxix, 145. *Feltz and Murray:* Jour. Biol. Chem., 1923, lvii, 573. *Folin, O.:* Am. Jour. Physiol., 1905, xiii, 66. *Gamble, J. L., Blackfan, K., and Hamilton, B.:* Jour. Clin. Inves., 1925, i, 359, 531. *Gamble, J. L., Ross, S., and Tisdall, F.:* Jour. Biol. Chem., 1923, lvii, 633. *Gardiner, J. P.:* Jour. Am. Med. Assn., lxxxv, 490. *Goodall, H. W., and Joslin, E. P.:* Quoted by Shohl. *Graham,* *E.:* Jour. Exp. Med., 1915, xxi. *Haden, R. L., and Guffey, D.:* Am. Jour. Obst. and Gynec., 1924, viii, 486. *Haden, R. L., and Orr, T.:* Jour. Exp., Med., 1923, xxxvii, 365, 367; 1923, xxxviii, 477; 1926, xliv, 419, 435. *Harding, V. J., and Drew, K.:* Jour. Obst. Gynec. Brit. Emp., 1923, xxx, 507. *Harding, V. J., and Potter, C.:* Brit. Jour. Exp. Path., 1923, iv, 105. *Harding, V. J., and Van Wyck, H.:* Am. Jour. Obst. and Gynec., 1926, xi, 1. *Harding, V. J., and Allin, K. D.:* Jour. Biol. Chem., 1924, lxii, 61; 1925, lxiii, 37; 1926, lxix, 133. *Harding, V. J.:* Physiol. Rev., 1925, v, 279. *Hartmann, A. F.:* Am. Jour. Dis. Child., 1926, xxxii, 1. *Hassellbach, K. A., and Gammeltoft, S. A.:* Biochem. Ztschr., 1915, lxvii, 206. *Hastings, A. B.:* Jour. Biol. Chem., 1921, xliv, 223. *Hofbauer:* Williams Obstetrics. *Kellaway and Hughes:* Brit. Med. Jour., 1923, i, 710. *Keith, N.:* Am. Jour. Physiol., 1922, lix, 452. *Kirstein, F.:* Zentralbl. f. Gynäk., 1923, xlvii, 1778. *Lawrence, R. D.:* Quart. Jour. Med., 1926, lxxvii. *Lenox:* Jour. Am. Med. Assn., 1924, lxxxii, 602. *Lenox:* Jour. Biol. Chem., 1925, lxvi, 521. *Lenox:* Arch. Int. Med., 1926, xxxviii, 11. *Lim and Ni:* Am. Jour. Physiol., 1925-26, lxxv, 475. *Loeb, J.:* Biochem. Ztschr., 1912, xliii, 181. *Losee, J., and Van Slyke, D. D.:* Am. Jour. Med. Sc., 1917, cliii, 94. *Lusk, G.:* Psysiol. Rev., 1921, i, 523. *MacCallum, W., Lintz, J., Wermilye, H., Leggett, T., and Boas, E.:* Bull. Johns Hopkins Hosp., 1920, xxxi, 1. *Marrack, J. and Boone, W.:* Brit. Jour. Exp. Path., 1923, iv, 261. *Marriott, W. McKim:* Am. Jour. Dis. Child., 1920, xx, 461. *Marriott, W. McKim:* Physiol. Rev., 1923, iii, 275. *McCann, W.:* Jour. Biol. Chem., 1918, xxxv, 553. *McCullough, H.:* Am. Jour. Dis. Child., 1920, xx, 486. *Mitchell, A.:* Am. Jour. Med. Sc., 1925, clxix, 236. *Mottram:* Jour. Physiol., 1909, xxxviii, 281; 1914, xlix, 23. *Murray, H.:* Arch. Surg., 1923, vii, 166. *Nakai, T.:* Tokio Jour. Biochem., 1925, v, No. 3. *Nash, T. T., Jr. and Benedict, S. R.:* Jour. Biol. Chem., 1921, xlviii, 463; 1926, lxix, 381. *Ohler, W.:* Med. Clin. N. Am., 1922, v, 1465. *O'Neil:* Proc. Soc. Exp. Med. and Biol., 1924-25, xxii, 124. *Opie, E.:* Jour. Med. Res., 1904, xii, 147. *Peters, J. P., Bulger, H. A., Eiseman, A., Lee, C.:* Jour. Biol. Chem., 1926, lxvii, 175, 219. *Piass, E., and Bogert, J. L.:* Bull. Johns Hopkins Hosp., 1924, xxv, 361. *Porges, O., and Novak, J.:* Berl. Klin. Wchnschr., 1911, xlviii, 1757. *Pritzi and Lichtmann:* Wien. klin. Wchnschr., 1923, xxxvi, 609. *Robison, R:* Biochem. Jour., 1922, xvi, 131. *Rowntree, L.:* Physiol. Rev., 1922, ii, 116. *Rubner, M.:* Quoted by Rountree. *Samson, W., and Woodyatt, R.:* Jour. Biol. Chem., 1913, xxx, 155. *Seibert, F. B.:* Am. Jour. Physiol., 1923, lxvii, 90; 1925, lxxi, 621. *Shohl, A. T.:* Physiol. Rev., 1923, iii, 509. *Smith, M.:* Jour. Biol. Chem., 1926, lxviii, 15. *Taylor, A. E.:* Quoted by Shohl. *Thalheimer:* Jour. Am. Med. Assn., 1924, lxxxii, 696. *Thalheimer:* Surg. Gynec. Obst., 1924, xxxix, 237. *Thalheimer:* Am. Jour. Obst. and Gynec., 1925, ix, 673. *Titus, P:* Jour. Am. Med. Assn., 1925, lxxxv, 488. *Utheim, K.:* Am. Jour. Dis. Child., 1920, xx, 366; 1921, xxii, 329. *Utheim, K.:* Jour. Metabol. Res., 1922, i, 803. *Van Slyke, D. D.:* Jour. Biol. Chem., 1921, xlviii, 153. *Whipple and Sperry:* Bull. Johns Hopkins Hosp., 1906, xvii, 71. *Whipple, G., and Cooke, J. V.:* Jour. Exp. Med., 1917, xxv, 461. *Williams, J. W.:* Obstetrics, ed. 5, D. Appleton & Co. *Williams, J., and Swett, M.:* Jour. Am. Med. Assn., 1922, lxxviii, 1024. *Williamson, H. C.:* Am. Jour Obst. and Gynec., 1923, vi, 263.

CIRSOID ANEURYSM OF THE UTERUS

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THE publication of the accompanying case has been prompted by the appearance of a recent article by Dubrenil and Loubat entitled *Aneurysme Cirsoïde de l'Uterus.*[1] The authors describe in minute detail a case of uterine aneurysm of which they can find no analogue in the literature, and state that their case is probably without precedent. The case herein presented corresponds clinically and histologically so closely to that of Dubrenil and Loubat that we are convinced that the conditions in the two cases are practically identical.

The writers' case, Mrs. E. W., aged thirty-two, was admitted to the Free Hospital for Women on April 11, 1926 for uterine bleeding. She had had four children and one miscarriage, the youngest child being twenty-five years of age. Her menstrual life had been regular with a normal menopause at the age of 48. Three weeks previous to entrance to the hospital she had had a sudden profuse bloody discharge from the vagina which had continued without cessation for two weeks. There had been during this period constant pain in the left upper quadrant, and a loss of 5 pounds in weight. The patient was a meager, poorly nourished woman. There was a soft systolic precordial murmur. Blood pressure 160-80. Hemoglobin 65 per cent. Pelvic examination revealed an atrophic uterus with some tenderness and indefinite resistance in the posterior culdesac. A diagnosis of probable carcinoma of the fundus was made, and the patient was prepared for a preliminary curettement and biopsy.

Operation April 15, 1926. Under anesthesia the uterus appeared somewhat enlarged posteriorly, and there was marked pulsation in the fornices. The cervix was easily dilated. Light passage of the currette produced no endometrial tissue but caused an immediate and formidable arterial hemorrhage. The uterine cavity and vagina were hastily packed with gauze, and the abdomen opened by a suprapubic incision. The uterus was found to be larger than normal and very spongy with an irregular outline due to enormously distended vessels. There was a marked varicosity of the left pampiniform plexus of veins. The entire body of the uterus pulsated strongly. Simple handling of the fundus lacerated the surface and produced an arterial gush of blood that was controlled with difficulty by large clamps that included the entire fundus. A rapid supravaginal hysterectomy was performed, numerous adventitious vessels from the cervical stump between the uterine vessels requiring ligature.

Convalescence. The patient made a good recovery from the operation and did well until seven days after the operation when she suffered difficulty in talking and an inability to move her right arm and leg. Dr. W. B. Robbins called in consultation pronounced the condition as probably one of cerebral hemorrhage and not embolism or thrombosis. The paralysis cleared up in about ten days and the patient was discharged in good condition on May 16, 1926, thirty-one days after operation. She reported on January 17, 1927, 9 months after the operation that she was in excellent health excepting for a slight disability of the right foot.

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[1] *Dubrenil and Loubat:* Ann. d' Anat. pathol., 1926, III, p. 697-718.

Radiosensitive cases are treated with 100 mg. of radium for forty-eight hours. One month later they are examined again and if induration persists or if bloody discharge has occurred 30 mg. are applied for eighteen hours.

Slightly sensitive cases are treated with 100 mg. for twenty-four hours, repeated at ten- to twelve-day intervals for three weeks; then, after interval of three weeks they are treated twice at three week intervals with 30 mg. for twenty-four hours.

Radioresistant cases are started with a dose of 30 mg. for twenty hours with a second dose of 100 mg. eight days later. Three weeks later the radium is reapplied in doses of 12 to 15 mg. every ten to twelve days for two or three months. Certain cases where the distribution of cancerous tissue is irregular are treated by inserting needles with 10 mg. of radium into the indurated areas for a period of twenty-four to thirty-six hours, repeating this exposure eight, fifteen, and in some cases twenty-four days after the first. THOS. R. GOETHALS.

Clark, John G., and Block, Frank B.: Relative Values of Irradiation and Radical Hysterectomy for Cancer of the Cervix. The Atlantic Medical Journal, 1924, xxvii, 696-699.

The authors draw the conclusion that radium is a palliative remedy of inestimable value in the great majority of hopeless surgical cases and of absolute curative value in a small percentage. While it challenges most favorable comparison with the radical abdominal operation, nevertheless they take no issue with the skillful specialist who still adheres to the radical viewpoint, provided he supplements his operation with postoperative irradiation. As to anteoperative irradiation, they are still doubtful, and await with interest the report from those clinics in which this prophylactic plan is employed. To discard or fail to use this new remedy as an adjunct to surgical measures in the face of such statistics as are now available should lay the objector open to a charge of criminal negligence. C. O. MALAND.

Hernaman-Johnson, Francis: The Analgesic Effects of X-rays in Cancer and Other Painful Disorders. The Practitioner, 1926, cxvi, 314.

Hernaman-Johnson discusses the pain relieving properties of the x-rays in cancer and other painful disorders and points out that they share these properties with other forms of radiation, radiant heat, and ultraviolet light. The relief of pain by heat is so well known a phenomenon that it is accepted as a matter of course, and excites neither incredulity nor wonder. It is generally "explained" by stating that the benefit is due to dilatation of surface capillaries. X-rays also produce capillary dilatation, though not of an obvious type. In neither instance is the explanation adequate, nor is the clinical result either more or less mysterious in the one case than in the other. ADAIR AND PROSHEK.

Daels and De Backer: A New Technic for Radium Treatment of Cancer of the Cervix. Le Progres Médical, 1924, No. 38, p. 558.

These authors feel that treatment of cervical cancer by x-ray is unsatifactory because the normal tissues also are subjected to prolonged radiations. It does, however, offer the advantage of radiating the lymphatic tissues of the pelvis en masse, a factor not accomplished when radium is used in the vagina. Therefore, these authors have worked out a technic by which they expose the parametrial lymphatics to radium by the extraperitoneal introduction of radium tubes. To this method they have given the name of "Radium Drainage" or "Radium Wertheim."

The capsules contain 3.3 mg. of radium element, filtered by 0.5 mm. of platinum. Two such capsules are contained in a sheath of 1.5 mm. of platinum. Two sheaths made up in this manner are introduced into an India rubber tube to which is attached a chain. The chains attached to each tube are sufficiently different to enable them to be used as markers. These tubes are then introduced into the parametrium through three small incisions.

The first series is placed one on either side of the pelvis in such a way that they lie between the ischial spines and the lateral sacral borders, the chains passing in front of the sacral iliac articulations. The second series of tubes is introduced laterally through small incisions just internal to the anteroir superior iliac spines. By means of a long curved forceps the radium tubes are pushed down to the level of the ischial spines. The third incisions are made along the external borders of the recti muscles one-half way between the anterior superior iliac spines and the midline. The aponeurosis is divided and the radium tubes pushed down along the lateral walls of the bladder to the levels of the lower incisions. The placing of the tubes is controlled in all instances by x-ray.

The doses employed have been for both the anterior and posterior sets of tubes as follows: four capsules of 3.3 mg. of radium element filtered by 2 mm. of platinum making 52.8 radium elements. To this must be added the 16 radium elements contained in the middle row or a total of 68.8 radium elements in all. The exposure was three days making 36 to 40 MCD. The cancerous crater was at the same time radiated by 50 radium elements for three days making 28 to 30 MCD.

There were twenty-three cases treated by this method all but three of which were beyond the stage of operability. Eight of these twenty-three or 34 per cent were living and clinically cured two and one-half years following treatment.

THEODORE W. ADAMS.

Schmitz, Henry: Five Year End-Results Obtained in Carcinoma of the Female Pelvic Organs with Special Reference to Radium and X-ray Therapy. Surgery, Gynecology and Obstetrics, 1924, xxxix, 775.

The five year end-results of radiation treatment of primary carcinomata of the female pelvic organs are presented. The absolute curability in a series of 180 cases is 15 per cent; the relative curability in 37 cases of clearly localized, single growth with a suspicion of beginning invasion of surrounding tissue is 46 per cent.

The radiation treatment of carcinomata of the female pelvic organs compares favorably with the surgical treatment. The grouping of carcinoma cases should be based on the results of the physical examination and not on the subjective interpretation of operability or inoperability.

The radiation treatment of recurrent carcinomata of the female pelvic organs has given only temporary subjective palliation, evidently due to the delay in applying for treatment soon after the operation. Patients who have had incomplete surgical operations should be subjected immediately to radiation treatment.

WM. C. HENSKE.

Cron, Roland S.: End-Results in the Treatment of Carcinoma of the Cervix. Wisconsin Medical Journal, 1924, xxiii, 128.

The author reports the outcome of patients suffering from carcinoma of the uterine cervix who were examined and treated in the department of obstetrics and gynecology at the University of Michigan from 1902 to 1920. Of the advanced inoperable cases, 320 out of 380, about one-half received some form of treatment but only 85 cases could be definitely traced. Every patient excepting one eventually died directly or indirectly from the uterine malignancy. Of all the palliative measures used, the actual cautery seemed to give the best results. The palliative measures, however, have only given temporary relief from the profuse and foul discharge and frequent bleeding. Of the 60 cases, where the disease was confined to the cervix and treated by radical abdominal operation, 40.9 per cent are living and well five or more years after operation. Primary mortality from shock or hemorrhage is 26.6 per cent but 60 per cent of those who survived the operation were permanently cured. Of all the cases of cancer of the cervix seen in the clinic only 5 per cent, however, were permanently cured. F. J. Souba.

Rouffart, E.: The Treatment of Cancer of the Cervix. Bruxelles Medical, 1926, vi, 519.

Rouffart, after having treated cervical cancer of various stages with radium, has returned to the radical operation in operable cases. Radium and deep radiation therapy are used as palliative measures in the inoperable cases and as an adjuvant to surgery in those cases where there is some broad ligament involvement. This procedure has been adopted because so many of his apparent cures after radiation in operable cases, have had, after several years, a return of the malignant pathology. Therefore he has come to feel that the results of radium alone are inconstant and deceiving. In concluding he states that as soon as serology, radiation, or any other form of treatment gives a solution to the cancer problem he will gladly abandon surgery but that, at present, in his hands at least, the latter procedure gives the best ultimate results. Theodore W. Adams.

Schmitz, Henry: The Treatment of Ovarian Cancers with Combined Surgical and Radiologic Methods. Wisconsin Medical Journal, 1924, xxiii, 125.

The author draws the following conclusions: (1) Operable ovarian cancers must be removed by an abdominal panhysterectomy and the operation followed by short-wave length x-ray therapy. (2) Inoperable ovarian cancers should be subjected to operation and the tumor masses removed if removal is possible. The incomplete operation as well as the clearly inoperable cases must be treated with the combined method of radium and short-wave length x-ray therapy. (3) Radiation therapy often causes an arrest of the growths, frequently even resolution with apparently normal bimanual findings and subjective well-being lasting for years. (4) Serous papillary and pseudomucinous cystadenomata with ascites and peritoneal implantation growths should be treated the same as ovarian cancers. F. J. Souba.

Engelhard: Concerning the Influence of Salvarsan Injections on Uterine Cancer. Nederlandsch Tijdschrift voor Verloskunde en Gynaekologie, 1924, xxix, 300.

A primipara was delivered in 1914 of a live child which, however, developed ulcers of the feet when three weeks old and died eight weeks after birth. The mother had had five mercury injections in the latter part of her pregnancy. She remained well until 1921 and the Wassermann reaction of her blood was persistently negative. At this time an elevated area appeared on the posterior lip of the cervix which had occasioned a watery discharge and slight bleeding for three months before she applied for treatment. It was decided that the ulcer was either a primary chancre or an ulcerating gumma. After three salvarsan injections, the lesion disappeared completely, leaving the cervix smooth. Antiluctic treatment was continued. After seven months the patient returned, having lost considerable blood during the past six weeks. The entire cervix was now rough and bled when touched. Excochleation yielded a large amount of tissue which proved to be a basal cell carcinoma. Infiltration of the parametrium made the case inoperable.

Engelhard discusses the possible relationship in this case of lues and carcinoma and quotes other authors who saw similar improvement, after salvarsan injection, in cases of carcinoma in presumably luetic patients. Since various observers have reported a positive Wassermann reaction in from 10 to 84 per cent of patients suffering from cancer, however, he cautions against being misled by this test in the differential diagnosis between these two diseases. R. E. WOBUS.

Green: Chorion-Epithelioma with Cerebral Metastases. The Medical Journal of Australia, 1924, ii, 498.

The case reported by the author has been subjected to a number of curetments previous to the present condition. Her last illness resulted in an absolute respiratory failure, the pulse remaining good even after respirations had completely ceased.

Postmortem examination showed involvement by the malignant growth of the uterus, lungs and brain. Of particular interest are the postmortem findings in the brain itself. There was a large, cystic cavity containing old blood filling the right front lobe, and a solid tumor, not quite 15 mm. in diameter, deep in the occipital lobe.

The writer points out two important phases as illustrated by this particular case. First, the characteristic history of recurrent hemorrhage associated with pregnancy; and secondly, the necessity of microscopic examination of all curettings.

NORMAN F. MILLER.

Extrauterine Pregnancy

Kok, F.: Etiology of Tubal Pregnancy. Klinische Wochenschrift, 1925, iv, 1213.

The author does not think that markedly tortuous tubes and so-called tubal diverticula play as important a rôle as Freund and Werth had maintained. The tubes of animals, such as the cow, always are very tortuous. Tubal diverticula are much more common in hogs than in the human; indeed, the author found this condition in 25 to 30 per cent. To date, there is reported in the literature only one case of tubal pregnancy each in the cow and the pig.

It cannot be denied that tubal pregnancy in the human is due in many cases to congenital or developed (especially inflammatory) tubal changes, resulting in a narrowed lumen, too small for the relatively large ovum to pass through, but large enough for the sperm. This pathologic implantation in a tube changed by inflammation can be explained in another way.

A damaged ciliated epithelium is probably not the cause. The total disappearance of ciliated cells in the tubal epithelium is physiologic in many animals. This loss of cilia occurs during or just following ovulation, therefore, at a time in which the egg has to pass through the tube.

The main factor in conveying the ovum to the uterus is the contraction of tubal musculature. These peristaltic movements have been disregarded to a great extent up to the present time.

The author has been able to demonstrate such peristalsis in experimental work. It is probable that this movement is mechanically stopped on one side or the other. This is common following inflammation. Schroeder says that a peristalsis, hindered and interfered by perisalpingitic adhesions, may not be able to transfer the ovum into the uterus. Sellheim thinks a connective tissue infiltration may detract from the capacity of tubal musculature to contract. In infantile tubes the musculature is only poorly developed. The strength and manner of muscle contraction show a relationship to ovulation. Putnin comes to the conclusion that the ovum itself is active by liberating the hormones necessary to start the transport mechanism, of which the most important factor is that of peristalsis. Furthermore, it seems plausible that a qualitative or quantitative variation in the hormon of the ovum, even with an intact tube, will prevent or alter the time of the normal tubal contraction. Thus, the egg itself is responsible for extrauterine implantation. An abnormal hormon function of the fertilized egg might inhibit the peristalsis an unusually long time.

Adair and Saffert.

Laurentie and Moussali: Extrauterine Pregnancy Which Followed a Tubal Patency Test. Bulletin de la Societe d'Obstétrique et de Gynécologie de Paris, 1925, xiv, 492.

A thirty-year-old patient who had had a puerperal infection in 1911 complained of sterility. A Rubin test was done on March 14, 1924, and the tubes were found to be patent. There were no menses after this and when examined on June 11, a tender, immobile tumor, the size of a child's head, was found on the left side. The patient had a metrorrhagia and a diagnosis of extrauterine pregnancy was made. Three days later a large thick piece of decidua was expelled and two days after this the patient had chills, fever, and tachycardia. A laparotomy was done and a large intraligamentary hematocele was found on the left side, due to a rupture of the left gravid tube. A three-months embryo was found among the blood clots. This was the only accident the author had in a series of 70 Rubin tests. J. P. Greenhill.

Schlink: A Clinical Contribution on Internal and External Migration of the Ovum and the Importance of Excising the Intramural Portion of the Fallopian Tube in the Operation of Salpingectomy. The Medical Journal of Australia, 1924, i, 555.

The author presents an intensely interesting article with review of the literature and presentation of cases which affords convincing clinical evidence of the various forms of migration. Numerous excellent cuts are included which help to clarify the discussion.

The first case presented by the author illustrates external migration of the ovum. This patient had been operated for ectopic gestation of the left side and an ovarian cyst of the right side. The left ovary and the right tube had been left in place. The patient had had several subsequent pregnancies, following which she was again operated upon, at this time for retroversion of the uterus and umbilical hernia, at which time the author was able to inspect the result of the previous operation as mentioned above. He found no evidence whatsoever of recurrent patency in the left tube, the side on which the ovary remained. Apparently the pregnancies which occurred following that operation could have occurred only by external migration of the ovum from the left ovary, through the right tube into the uterine cavity.

The second case reported by the author illustrates internal migration of the ovum. This patient, three years previous to the time she was seen by the author, had had an operation for the removal of the right tube and ovary. The patient was brought into the hospital in a condition of shock and before anything could be done the patient died. A postmortem examination, however, showed a mass at the region of the right horn, the size of a small orange. This mass showed a large, irregular perforation through which chorionic villi were protruding, and a sac filled with amniotic fluid in which was suspended a three or four months' embryo. The uterine cavity itself contained also a three to four months' pregnancy. This case illustrated internal migration of the ovum, since the ectopic pregnancy took place in the blind canal of the remaining portion of the right tube.

The third case reported by the author illustrates both external and internal migration of the ovum. This patient was operated upon for an inflammatory condition of the pelvis. A left salpingectomy and right oophorectomy were performed. The intramural part of the tube was not excised. Two years later the patient revealed a large, irregular rent in the position of the cut off stump of the left tube, the ragged edges being covered with much blood. No fetus, however, was found. In this case it was necessary for the ovum to pass from the left ovary over to and through the right tube, then across the uterine cavity to the remaining portion of the left tube, illustrating the external and internal migration of the ovum.

In concluding the author brings out the practical aspect of this condition as well as the question of migration, stressing the point that it is necessary to remove the entire intramural or muscular portion of the tube at the time of doing the salpingectomy. NORMAN F. MILLER.

Zimmermann, R.: The Formation of Decidua in the Gravid Tube. Monatsschrift für Geburtshilfe und Gynäkologie, 1926, lxxii, 30.

In over 100 specimens Zimmermann found a more or less marked decidual reaction in most of the fallopian tubes during uterine pregnancy. In a case of tubal pregnancy a definite decidual reaction was found.

The mucosa of the tube cannot form a spongiosa and compacta because of the lack of proper gland elements, hence it always consists of a compacta only. In many cases of tubal pregnancy an inflammatory process is the cause. In many cases of chronic endosalpingitis there is an atrophy of the mucosa. If an ovum becomes embedded in such a mucous membrane, the fetal elements soon reach the musculature of the tube because the mucosa is very thin. Furthermore, there is very little decidual reaction in such a mucosa. In the cases of normal mucosa, however, when an ovum embeds itself, a decidual reaction can occur. This may explain the cases in which a decidual reaction is lacking at the site of implantation in the tube but is found in another part of the tube. Such an explanation supports the hormonal theory as opposed to the theories which claim that the development of decidua in the tube depends upon an inflammatory process. J. P. GREENHILL.

Momigliano, I.: Recurrent Tubal Pregnancy. Archivio Italiano di Chirurgia, 1925, xi, 792.

Describing 16 observations of a recurrence of tubal pregnancy and considering carefully the extensive literature on this problem, the writer draws the following noteworthy conclusions: A recurrence is likely in about 5 per cent of operated cases. An intrauterine pregnancy follows in about 28 per cent of the cases having had an extrauterine pregnancy. The recurrence is more likely when the pregnant tube was not completely extirpated. The implantation of an ovum in the other tube is favored by a salpingostomy made for more or less marked occlusion. The very same causes which were responsible for the first tubal pregnancy most often also lead to the recurrence, especially in cases not operated upon. The risk of a second extrauterine gestation is not large enough, however, to justify sterilization. The surgical treatment on principle should be conservative. HUGO EHRENFEST.

Roca, M. Garriga: Contribution to the Study of the Pathology of Ectopic Pregnancy. Revista Espanola de Obstetricia y Ginecologia, 1925, x, 97.

Roca reports a case of a woman in labor at term brought to the Barcelona clinic in a state of exsanguination. Delivery was effected promptly, but the patient died before the third stage was terminated. Autopsy showed a general acute anemia, with a large fibroma of the lower uterine segment from which the bleeding had occurred. An adnexal tumor was found occupying the place of the left ovary, cystic, 12x9x9 cm. noninflammatory and filled with old blood. The walls of the cyst were some 4 mm. in thickness, smooth throughout save for two carneous papillary projections at the hilum, which on microscopic examination were found to be composed of compact decidual tissue. No lutein cells or chorionic villi were found. The author believes that this represents an ovarian pregnancy interrupted by ovarian apoplexy.

He reviews the various theories of causation of ectopic pregnancy, and concludes that the ovum becomes fixed in its ectopic site not because of mechanical obstructions (polyps, fibroids, cysts), or of inflammatory conditions (tubal catarrh, endo- or perisalpingitis), but because the particular ovum has undergone acceleration of its development and growth, and because of a marked decidual reaction in either the tube or the ovary. This process is atavistic (cf. implantations in rat, rabbit, and guinea pig). Because the peritoneum has never been found to undergo a decidual reaction, primary abdominal pregnancy is therefore probably impossible.

THOS. R. GOETHALS.

Le Filliatre: Appendicitis and Extrauterine Pregnancy. Journal de Médicine de Paris, 1925, xliv, 140.

Le Filliatre reports the following case: Patient, twenty-eight years old, had been suffering for the two previous years with intermittent attacks of abdominal pain, which had been diagnosed and treated as appendicitis. She had not menstruated for six weeks when she was suddenly taken with severe sharp pain in the right lower abdomen. The pulse was 100, temperature 38.6° C. Examination showed pain and muscle spasms in the right lower quadrant, with pain and the sensation of a mass in the right side of pelvis.

Upon opening the abdomen, the right tube was found to be the seat of a ruptured ectopic pregnancy. The appendix, part of the omentum, and the right tube and ovary were bound together by adhesions. The uterus was slightly enlarged, while the left tube and ovary were normal. The appendix, which showed definite evidence of inflammation, was removed as were the right tube and ovary. Bacteriologic examination of the tube and ovary showed B. coli.

In discussing the case, Le Filliatre feels that appendicitis probably accounts for the fact that tubal pregnancies occur more frequently on the right than on the left side.

THEODORE W. ADAMS.

Koerner, J.: Differential Diagnosis of Ectopic Pregnancy. Münchener medizinische Wochenschrift, 1926, lxxiii, 925.

The author reports two cases, both operated upon for ectopic pregnancy owing to errors in diagnosis. The first patient aged thirty-nine, had had nine previous pregnancies. All were normal. Her menstrual history was normal except that her last period was one week past due. Two days prior to her admission she received a severe blow on the abdomen which was followed shortly afterward by a sharp pain at the site of the trauma, headache, and chills. There was some evidence of internal bleeding. Operation was delayed but after a third collapse a laparotomy was done and the pelvis explored. There was a large hematoma of one tube. The tubes were closely examined but no ectopic pregnancy could be found. The uterus was normal in size. There were some bleeding veins in the mass of delicate tissue where the hematoma had formed. These were ligated and the hematoma removed. It was decided that the patient was not pregnant (which was further proved by microscopic examination of the excised tissue) and the abdomen was closed. The patient made an uneventful recovery.

The second patient, thirty-three years of age, had had six pregnancies. Her menstrual history was normal. Her last period was one week overdue and of one day's duration. Vaginal examination revealed a tumor about one and one-half times the size of a fist and a laparotomy was done in the expectation of finding an ectopic pregnancy. The uterus and adnexa were normal but to the operator's surprise the sigmoid was found quite distended and containing numerous large varicosities on its peritoneal surface. This enlargement corresponded to the mass felt on vaginal examination. The abdomen was closed. Later, upon further questioning, the patient stated that she had hemorrhages from the bowel for which she had never been treated. The patient made a good recovery although she was not relieved of her bowel trouble.

The first case required an immediate operation for relief of an internal hemorrhage, yet the diagnosis of ectopic pregnancy was wrong. In the second case error of diagnosis might have been prevented by more precision in regard to her past history. W. B. SERBIN.

Zeitlin, L.: Diagnostic Puncture of the Culdesac in the Presence of Extrauterine Pregnancy. Monatsschrift für Geburtshilfe und Gynäkologie, 1926, lxxii, 168.

During the last twelve years at the Leningrad Clinic there were 636 cases of extrauterine pregnancy and in 161 of these (25.3 per cent) a pelvic puncture was performed. In none of the cases was injury caused by the puncture, hence the procedure is harmless. The puncture must be performed exactly in the midline of the posterior fornix and it should not be employed in cases of shock. Pelvic puncture is important because it helps to select the type of operation to be performed. If pus is found mixed with blood, if there is evidence of degeneration of blood, or if microorganisms are found in the blood, one should limit the operation to a posterior colpotomy and not perform a laparotomy because the latter is dangerous in the presence of these findings. The withdrawal of blood by means of a pelvic puncture is successful in 90 per cent of the cases in which blood is present in the abdominal cavity. Because of the high percentage of failures, however, one should not rule out ectopic pregnancy when a negative result is obtained. In such cases reliance should be placed upon the history and the objective findings. In advanced cases, fetal elements may be found in the blood obtained, but in these cases more information can be secured from a colpotomy than from a puncture. In the very acute cases of ectopic pregnancy one should not lose time by performing a colpotomy but one should do an abdominal operation immediately. When a pelvic puncture is to be followed by a laparotomy the latter should be performed immediately after the puncture. J. P. GREENHILL.

Farrar: Leucocyte Count in Diagnosis of Ectopic Gestation. Surgery, Gynecology and Obstetrics, 1925, xli, 655.

In ectopic gestation the leucocyte count fluctuates according to the amount of fresh blood thrown into the peritoneal cavity and the rate of absorption. The leucocyte count tends to drop quickly to normal as the blood in the peritoneal cavity is absorbed or walled off; 48 per cent of 150 cases of ectopic gestation had a normal leucocyte count before operation was performed. The leucocyte count was normal in 29 cases of unruptured tubal pregnancy in which there was no free blood and in 43 cases of ruptured pregnancy in which the blood was walled in. The leucocyte count was an index in 150 cases to the amount of free blood in the peritoneal cavity and the polymorphonuclear leucocyte count was increased markedly only in cases having fresh blood in the pelvis and increased in direct proportion to the amount of recent blood found at the time of operation. The fluctuating leucocyte count together with the moderate elevation of temperature differentiates ectopic gestation from a purulent salpingitis with its more uniformly high leucocyte count and fluctuating temperature. In cases of rupture of tubal pregnancy the steadily rising leucocyte count indicates active bleeding before the fall in the number of red cells or hemoglobin gives warning of the condition. The leucocyte count to be of diagnostic value must be taken at least daily and in critical cases even hourly and used in conjunction with the history and clinical findings in the case. WM. C. HENSKE.

Vogt, E.: The Sense of Smell as an Aid in the Diagnosis of Intraperitoneal Hemorrhage. Medizinische Klinik, 1925, xxi, 804.

Usually the diagnosis of intraperitoneal hemorrhage is easily made but there are cases where there is difficulty and consequently operation is deferred until it is too late. To the Cullen sign of intraperitoneal hemorrhage (bluish discoloration of the umbilicus) and the blood sedimentation test of Linzenmeier, Vogt adds his aid, namely, a characteristic odor. He cannot describe it but says that once it is found it will always be remembered. This odor is intensified by the mere cutting of the skin, more so when the fascia is cut and the muscles separated and when the peritoneal cavity is opened the odor is most pronounced. The odor, however, is found only in those cases where there is marked hemorrhage and the patient is in a critical condition.

Bätzner found that clinically the symptoms preceding death due to slow persistent hemorrhage are the same as those due to extensive burns or to freezing. He found that after bleeding animals almost to death and injecting the remaining blood serum into other healthy animals, the latter became anemic and died. Bätzner assumes that a poison, probably the result of broken-down proteins, is present in the blood serum of exsanguinated animals. The injection of fresh blood prevents the production of these poisons.

Vogt says it does not matter whether the bleeding is external or internal and he assumes that in women with intraperitoneal hemorrhage, the toxins in the blood reach all parts of the body and change the odor of the body. Bätzner's theory is interesting further because it speaks against the reinfusion of the blood found in the peritoneal cavity. J. P. GREENHILL.

Hammerschlag: Is Blood Transfusion Necessary in Cases of Extrauterine Pregnancy? Monatsschrift für Geburtshilfe und Gynäkologie, 1925, lxix, 51.

It is remarkable with what rapidity patients with extrauterine pregnancy recover after the source of bleeding is ligated at operation. These women recover more quickly from their anemia than do women who have lost similar amounts of blood during abortion or labor. The author operates for an ectopic pregnancy as soon as the diagnosis is made. Of 195 patients operated upon during the last seven years, 188 were cured. Among 22 cured cases who were almost pulseless at the time of operation, blood transfusion was used four times, whereas in the remaining 18 cases, intravenous or subcutaneous salt solution combined with hypodermics of caffeine and camphor were given.

Experimentally it has been shown that transfused blood is functionless. After the transfusion there is no marked increase either in the hemoglobin content or the red blood cell count. When there is an increase it usually disappears after a short time. On the other hand, there may be hemolysis with icterus and hemoglobinuria. Regeneration of blood is not essentially quicker after transfusion than without it. Transfusion therefore does not replace the lost blood nor does it produce a permanent improvement in the blood picture. The only value of transfusion is the stimulation of the erythropoietic system and the introduction of serum. Since, however, transfusion may often produce bad results and even death, it should not be used without a strict indication and only as a last resort. This is practically never necessary in cases of extrauterine pregnancy where a quick and exact operation is the essential thing. J. P. GREENHILL.

Krause: A Young Ovarian Pregnancy. Zeitschrift für Geburtshülfe und Gynäkologie, 1924, lxxxvii, 390.

The author describes in detail and illustrates a young ruptured ovarian pregnancy removed from a thirty-five-year-old woman who had had two children previously.

MARGARET SCHULZE.

Phaneuf, Louis E.: Intraperitoneal Hemorrhage from Ruptured Ovarian Cyst. Journal of American Medical Association, 1924, lxxxiii, 658.

The writer reports three cases of ruptured cysts of the ovary with severe intraperitoneal hemorrhage, two were follicular cysts, one a corpus luteum cyst. In the literature only twenty cases of ruptured follicular cysts and twenty-two cases of ruptured corpus luteum cysts were found. The diagnosis was in most cases established after opening the peritoneal cavity; usually a preliminary diagnosis of ectopic pregnancy or acute appendicitis had been made. The etiology of the author's three cases could not be made out, but these hemorrhages occur most likely under the influence of traumatism including that of bimanual examination. GROVER LIESE.

Nash: Rupture of Tubouterine Gestation Which Was Concurrent with Intrauterine Gestation. The Lancet, 1924, ccvii, 494.

The author had seen three cases of tubouterine gestation, and reports here the third case.

The patient was admitted to the hospital and operated upon with recovery. A study of the specimen revealed a swelling at the site of the entrance of the right tube to the uterus, which had ruptured, and from which chorionic tissue projected. Attached to and overlying this, was a mass of chorionic tissue, the center of which was formed by a cavity, one inch in diameter, lined by a smooth membrane, and revealing what was probably the umbilical cord.

The uterus itself measured four inches and contained an embryo about one-half inch in length. The uterine fetus appeared to be about six weeks old. The author speculates on the possibility of the two pregnancies starting at the same date.

NORMAN F. MILLER.

Hermans: An Unusual Case of Extrauterine Pregnancy. Nederlandsch Tijdschrift voor Geneeskunde, 1924, i, 1410.

A woman was brought to the clinic with a history of bleeding for six weeks and having been ill for two months. She looked ill and pale, her temperature was normal, the pulse being 130. The abdomen was somewhat distended and pelvic examination left the diagnosis in doubt between ectopic pregnancy and pelvic inflammation. She gradually developed a high fever with all symptoms of acute peritonitis. Five weeks after admission, she went into collapse, but responded slowly to stimulants and hypodermoclysis. Later on during the day she developed a bloody diarrhea which lasted for two days, when she passed a fetus per rectum. After a blood transfusion she made a slow but steady recovery. R. E. WOBUS.

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THE NASAL APPLICATION OF PITUITARY EXTRACT FOR THE INDUCTION OF LABOR*

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THERE can hardly be found in the history of medicine an example of a potent drug becoming so rapidly known throughout the medical world as the use of pituitary extract in obstetrics. Nevertheless, an acrimonious debate is still in progress as to whether the introduction by Hofbauer in 1911 of the use of pituitrin as a powerful stimulant of uterine contractions *during labor* represents an important development in modern obstetrics (V. E. Henderson, Guggisberg and others), or whether it should be considered as a questionable addition to our armamentarium, in view of the fact that certain untoward effects may be produced both upon mother and child when it is improperly used.

In face of the fact that the obstetrician finds himself in a maze of conflicting statements upon so important a subject, due credit must be given to the French committee which in 1925 made a clinical investigation of the question by means of a questionnaire sent to the prominent French and Swiss clinicians. Not considering a number of over-enthusiastic answers, the opinion prevailed that pituitary extract, with its power of producing regular, rhythmical and forcible uterine contractions, should be regarded as a most beneficent and valuable agent, which, however, should always be employed with care and a realization of its limitations and dangers.

Although practically no new ground has been broken since the indi-

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cations and contraindications for the use of pituitary extract in obstetrics had been outlined by one of us (J. H.) in 1911 and 1912, it is noteworthy that in the recent literature on the subject, a warning note has repeatedly been sounded against the hypodermatic employment of 1 c.c. of the extract, which we had set and steadfastly maintained as the standard dose. Blair-Bell, Eversman, Jung, A. Stein and Framm, insist that the initial dose during labor should not exceed 2 to 5 minims. We do not propose to discuss this point beyond saying that our own experience in recent years is in accord with such statements.

It is the purpose of this paper to present a new method of application of pituitrin chiefly for the induction of labor, and to discuss its advantages over the technic employed up to this time. It should be emphasized at the outset that, up to the present, according to the recent studies of W. A. Scott, "there is no method of inducing labor that is absolutely free from danger to either mother or child, and more particularly Watson's method has some dangers for the child even with the best of technic. It is obvious that if one feels that there is at hand a safe method of starting labor, and especially one not requiring mechanical interference, one will likely feel justified in inducing it in many cases where there would be a hesitancy to use a method that was either dangerous or technically difficult."

The senior writer has employed pituitary extract for the purpose of inducing labor at, or beyond, term, since 1911, and he found that the most convenient method of giving it was by subcutaneous injection. In his several reports he emphasized, first, that the method cannot always be relied upon; second, that the chances of success are considerably greater in multiparae than in primiparae; third, that a certain period of noneffective, painless uterine contractions preceding the administration of the pituitary extract is essential for a good result; and finally, that the method was not effective in interrupting pregnancy before term. These conclusions were later confirmed by a number of investigators. B. T. Watson, in 1920, in attempting the induction of labor supplemented the well-known combination of quinine and castor oil by the hypodermatic administration of 0.5 c.c. doses of pituitary extract at half hourly intervals until labor set in or until six doses had been given. While Watson claims that his technic was successful in 90 per cent of his cases and gave rise to no maternal deaths and had a fetal mortality of just over 6 per cent, less favorable results have been obtained by others.

Williams, in following the same technic, obtained the desired results in approximately seven out of ten cases near term, but did not think its value was great in toxemic patients because it was useless before the last two months of pregnancy. Moreover, his observations led him to believe that the fetus was in some instances lost as the result of interference with the uteroplacental circulation by the violent and prolonged contraction of the uterine muscle. DeLec does not use the method "as the action of pituitrin is not controllable." For further information on this subject the reader is referred to Scott's paper, which gives a comprehensive account of the opinions held by a number of clinicians on this Continent. Scott concludes that Watson's method has some danger for the child even with the best technic, and that it is due for the most part to the occasional tetanic contractions which sometimes follow the use of the drug.

It was the recognition of these shortcomings of Watson's technic which caused us to seek some method of improving it, aside from an endeavor to widen, if possible, the field of indications for its application. Two main considerations influenced our search for new channels through which pituitary extract may be absorbed in a more effective and at the same time in a less dangerous way. Since a consensus of opinion has developed that the best results follow the repeated administration of small doses during a number of hours, the desideration seemed to be to discover, if possible, whether the local application of pituitary extract to some mucous membrane, with a highly developed blood and lymph supply, would permit its *slow* and *steady* absorption. Needless to say, the avoidance of local injury to the tissues by the local use of the drug, constituted the first prerequisite. Having regard to the clinical experience that patients vary in their reaction to pituitary extract, the possibility of *withdrawing the drug* from the mucous membrane to which it had been applied, and thus preventing further absorption, as soon as the tendency of the uterus to pass into tetanic contraction became noticeable, was considered an essential feature of any attempt to replace the hypodermatic route.

In casting about for a convenient method which would answer both purposes, the *oral* administration of pituitary extract was first considered, largely because recent experimental and clinical work had determined the degree of absorption of various drugs and chemicals when orally applied. Thus, Lasch and Neumayer had noted that a marked elevation of the calcium level in the serum occurred within thirty to sixty minutes after oral administration of calcium chlorid, and Lasch and Brügel and others have shown that a certain degree of hypoglycemia follows the oral administration of insulin if certain precautions are rigidly observed. Various attempts have been made to ascertain whether the administration of pituitary extract by mouth can produce systemic reactions. Rowntree, Barker and Mosenthal report that they have observed no effect after its administration by the mouth, but Wolpe, Hamill, and Donaldson, on the contrary, have recently found that small doses per os do cause an increase in uterine and intestinal activity. No effect on blood pressure was noted. Donaldson claims to have been successful in treating cases of uterine hemorrhage by oral administration of pituitary extract, and Morris and Weiss report similar results in a case of dyspituitarism, although it had generally been held that the extract is rendered inert by the action of the gastric juice or by the intestinal or pancreatic enzymes.

The striking effects of pituitary action after oral administration were clearly evidenced by the experimental work of Knaus, who showed that after a latent period of about eight minutes it exerted a marked effect upon the uterus, increasing both its tone and automatic movements. Since satisfactory evidence of an adequate resorption of the oxytocic substance from the sublingual region had been afforded by these experiments, the next step to be taken in transposing such observations into obstetric practice, was clearly indicated. It had, however, to be borne in mind, that our information as to the absorption rate of drugs in general when given by mouth is quite defective; and whether the alterations in the local conditions of the oral mucous membrane, which occur as a biologic response to the pregnant state, are apt to accelerate or retard the absorption of chemicals, still remained to be determined.

The method we employed last summer in 31 patients both for the purpose of inducing labor and of stimulating pains in cases of inertia uteri, consisted in the preliminary sensitization of the uterus by means of the well-known combination—hot enema, castor oil and quinine—followed by the subsequent administration of pituitary extract by mouth. A period of two to three hours was allowed to elapse between the preliminary preparation and the administration of the first dose of pituitrin in order to make sure that the former had not been sufficient to induce pains. In order to make the commercial preparation of pituitrin extract more palatable, about five grains of granulated sugar were added to ten minims of pituitrin and the whole diluted with water to one dram. Bearing in mind that Knaus had found the most rapid absorption occurred from the sublingual region, the patients were instructed to hold the mixture beneath the tongue for five or more minutes before swallowing it. Each dose was prepared from a fresh ampule of pituitrin just before its administration. Invariably uterine contractions ensued in from three to eight minutes. The contractions lasted from fifteen to ninety seconds and were separated by periods of relaxation of from one to ten minutes. In none of the patients did tetanic contraction of the uterus occur, although occasionally an abnormally high tonicity of the uterine wall was observed. Auscultation of the fetal heart showed no greater variations than are observed during the normal first stage of labor, while in normal, as well as toxemic patients, the blood pressure showed practically no variation.

Influenced by the technic employed by Watson, we repeated the oral administration of pituitary extract at half-hour intervals for four doses, regardless of whether the contractions continued or not, unless definite labor pains supervened. Several of our patients began having real pains before the series of four doses was completed, but the great majority did not complain of pains until two to four hours after the last dose.

TABLE I

CASE	AGE	RACE	PARA	DURATION OF PREGNANCY	INDICATION FOR INDUCTION	DOSES OF PITUITRIN	RESULT	REMARKS
U 6696	20	C	I	2 weeks overterm	Overterm	4	Success	----------
U 6666	17	C	I	Term	Contracted pelvis	4	Success	Delivered by cesarean after trial of labor.
U 6644	34	W	V	Term	Hydramnios	4	Success	Excessive sized child.
U 7190	20	W	II	Term	Pro causa exercitii	4	Success	----------
U 7266	25	C	I	Term	Pro causa exercitii	4	Success	Intramural myomata.
U 7321	23	W	I	Term	Pro causa exercitii	4	Success	Cervical canal intact. Membranes ruptured prematurely.
U 7401	16	W	I	9 months	Pro causa exercitii	4	Failure	----------
U 7546	16	C	I	Term	Pro causa exercitii	4	Failure	Spontaneous labor 4 days later.
U 8073	38	C	VI	Term	Pro causa exercitii	4	Failure	Spontaneous labor 5 days later.
U 8120	21	W	II	9½ months	Pro causa exercitii	4	Failure	Spontaneous labor 13 days later.
U 6924	17	C	I	Term	Dead fetus	3	Success	Syphilis. Macerated child.
U 5876	23	W	V	9½ months	Pyelitis	4	Failure	Another failure 7 days later. Spontaneous labor two weeks later.
U 6672	34	W	VII	Term	Nephritic toxemia	4	Failure	Bougie inserted after fourth dose of pituitrin with prompt success.
U 6824	26	C	III	9 months	Mild toxemia	4	Failure	----------
U 2685	41	C	V	8½ months	Nephritic toxemia	4	Failure	----------
U 7501	20	W	I	Term	Nephritic toxemia	4	Success	Three previous ununsuccessful attempts during the preceding 2 weeks. Child 45 cm. long, weight 2225 gm.
U 7856	19	C	I	9½ months	Mild toxemia	4	Failure	Spontaneous labor 16 days later.
U 1842	25	W	I	Term	Preeclamptic toxemia	4	Success	--------
U 4656	22	W	I	1 week overterm	Mild toxemia	4	Failure	Pains began 24 hours later.
U 7977	18	W	I	2 weeks overterm	Overterm	4	Failure	Spontaneous labor 4 days later.

We employed the technic above outlined for the induction of labor in 20 patients: 12 primiparae, 8 multiparae; 11 of whom were at term, 3 postmature, and 6 prior to term. The indications were—postmaturity, toxemia, severe pyelitis, dead fetus in utero, as well as pro causa exercitii in certain patients at or near term. Altogether, labor was successfully induced in nine out of the 20 patients,—an efficiency of 45 per cent. It might be mentioned that in five additional patients, induction followed the preliminary treatment alone, so that there was no necessity for giving the pituitrin.

Table I summarizes the results obtained by this method and gives details as to the indications and results in the individual patients.

In eleven additional instances the same technic was employed to stimulate pains in patients who were already in labor, but in whom the pains had stopped for a number of hours. In such cases, the method was employed irrespective of the degree of cervical dilatation and regardless of whether the membranes were ruptured or not. In ten of these cases a satisfactory result was obtained without ill effect to either mother or child. The following abbreviated history illustrates the course of events in one of the successful cases.

A 28 year old colored para iii, at term. Admitted 6 P.M., 8/29/26. Vague pains. Cervix 3 cm., head floating in L. O. A. Patient slept throughout the night,—no pains. At 8 A.M., 8/30/26, induction started by hot soap suds enema and a hot drink. 9 A.M. 1 ounce of castor oil and 10 grains of quinine sulphate by mouth. Quinine repeated at 9:30 and 10 A.M. At noon conditions the same as 18 hours previously. At 12:30 P.M. pituitrin mx by mouth was given. Good contractions began. Pituitrin repeated at 1, 1:30 and 2 P.M. After the last dose, regular pains at 8 minute intervals. Delivered spontaneously at 9:40 P.M. Child in excellent condition, 2860 gm.

In summing up, it is interesting to note that in this series the oral administration of pituitary extract rendered efficient service in stimulating uterine contractions in a certain number of cases. As the results obtained could not be considered as ideal, it was only natural to attempt to discover some other portal of entry, from which the pituitary extract could be absorbed more satisfactorily. Upon reviewing the various pathways through which drugs are known to be absorbed, our attention was directed particularly to the nasal route, as the result of certain fundamental findings by H. W. Freund, who reported that definite changes could be observed in the mucous membrane covering the inferior turbinate bone and the tuberculum septi as well—hyperemia, swelling, hypertrophy, in two-thirds of all pregnant women. These changes have their counterpart in the pregnancy reaction first described by Hofbauer in the interarytenoid region of the larynx. Moreover, following Fliess' suggestion that some relationship exists between certain areas of the interior of the nose and the female generative tract, various experimental and clinical investigations made during the last two decades brought to light a number of facts in support of this idea. In this connection, we would refer to attempts made in the Vienna clinic to relieve labor pains and dysmenorrhea by the local application of cocaine to the inferior turbinate bone; as well as to the interesting recent observations of Abel and Geiling, Rowntree, and Blomgard that the application of pituitary extract to the nose leads to beneficial results in cases of diabetes insipidus.

ANATOMIC CONSIDERATIONS

Before considering the technic employed in the nasal administration of pituitrin to our patients, we shall briefly review certain points in the anatomy of the nose which are of importance in this connection.

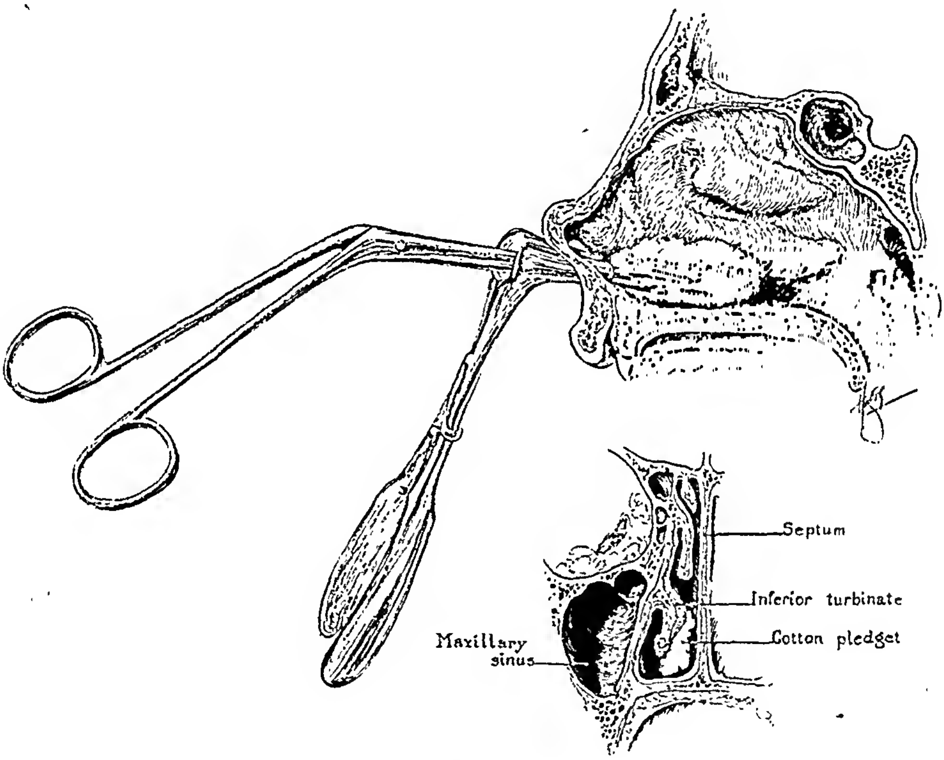

Fig. 1.

The accompanying semidiagrammatic representation of the lateral nasal wall shows the turbinate bones, and particularly the inferior turbinate bone, which extends throughout the entire length of the floor of the nasal cavity. Under normal conditions, the mucous membrane covering the inferior turbinate is a spongy, highly vascular, erectile tissue, and it is now universally admitted that the vascularity and tendency to engorgement are markedly increased during pregnancy. Beneath the surface epithelium lies a connective tissue stratum rich in mucous glands, lymphatics and blood vessels, an extensive network of large venous sinuses being particularly prominent. Of the lymphatic distribution in this region, little is known, as attempts to trace it by injection have always failed, because of simultaneous injection of the vascular bed. The direct drainage, however, is into the deep cervical lymphatics.

In connection with the therapeutic utilization of the nasal mucosa, great interest attaches to the possible routes along which absorption may occur. Among other possibilities, it is interesting to inquire whether material absorbed from the nasal mucous membrane can pass through lymphatic channels directly to the subarachnoid space. While there is not complete agreement on this point, certain observations, notably those of Simon Flexner, speak strongly in its favor. He believes that in acute anterior poliomyelitis the pathway of infection is through the upper respiratory tract, and his experiments point to the passage of organisms from the nasopharynx to the subarachnoid space along lymphatics which accompany the filaments of the olfactory nerve.* Furthermore, Schloss emphasizes the fact that, in children, a surprisingly small patch of inflammation in the nasopharynx may excite convulsions, stupor and other phenomena indicative of considerable cerebral irritation. Other observers have reported the recovery from the cerebrospinal fluid of dyes previously injected into the nose. Again, in recent years, a great deal of interest has centered around the presence in the adult of an additional cranial nerve, which is distributed to the mucosa of the nasal septum,—N. terminalis. According to the studies of Johnston numerous small groups of ganglion cells are interspersed along both the peripheral and intracranial course of this nerve, whose central connections with the frontal portion of the brain are in the form of two or three roots which pass through the cribriform plate of the ethmoid bone in company with the vomeronasal nerve. Moreover, when one considers the extraordinary richness of the vascular and lymphatic beds in the turbinal mucous membrane itself, it seems obvious that solutions applied to it would pass almost immediately into the general circulation both by blood stream and by lymphatic absorption, and we believe that this direct absorption is far more important than the meager and circuitous olfactory terminalis route described above. Taking all of these considerations into account, we assumed that this pathway might possibly be utilized for our purposes, and we decided to subject it to clinical investigation.

TECHNIC

The following technic was developed. Under direct vision, with the aid of a nasal speculum and reflected light, the nose is carefully examined and cleaned of any crusting or discharge. A small pledget of cotton of such size as to fit easily, but snugly, between the septum and the inferior turbinate is then prepared, and after being moistened with twenty minims of pituitary extract is inserted under the anterior end of the inferior turbinate (see Fig. 1). Obviously, if the procedure is to be successful, it is important that the impregnated pledget should lie in snug contact with the absorbing surface rather than loose in the nasal cavity. If the pledget is inserted gently, the patient does not experience any appreciable discomfort and in none of our cases was it necessary to resort to a local anesthetic.

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*Weed's studies showed that a pathway exists between the subarachnoid space and the lymphatic spaces beneath the nasal mucous membrane.

Hoping to effect a continuous but slow absorption of pituitary extract, we at first applied a pledget containing ten minims of the drug to each nostril. The first change noted was a marked increase in fetal movements which almost routinely preceded the first uterine contractions, the latter coming on invariably within one to five minutes after application of the drug. These first contractions were timed and the fetal heart auscultated at frequent intervals. In the event that a contraction lasted longer than four minutes, or the fetal heart showed untoward changes, the pledgets were immediately withdrawn, after which the tetanic contraction always subsided in from one to five minutes with coincident complete recovery of the fetal heart. Subsequently rhythmic contractions alternating with periods of relaxation continued, and usually in such cases no further administration of the drug was required. We noted that the longest contractions came on almost immediately after the pledgets were introduced, so that if no tetanic contraction occurred during the first twenty minutes, we considered that the danger from such an accident had passed. Unless true labor pains set in within two or three hours, the contractions gradually became shorter and weaker and recurred at longer intervals. Accordingly, when it became evident that the effect of the first administration was wearing off the pledgets were removed and replaced by fresh ones containing the same amount of pituitrin. In the majority of our cases, one to three applications were required for a successful induction of labor, but in a very few cases as many as five doses were necessary. The pledgets on removal were always heavily coated with mucus, suggesting that some time had probably elapsed since any appreciable amount of pituitrin had been able to break through the mucous barrier and be absorbed. This point was further substantiated by the observation that the original blanching effect on the nasal mucous membrane had always disappeared when the pledget was removed after having been in place for as long as one hour. In addition, the presence of pledgets in both nostrils for such long periods of time caused considerable irritation to the mucous membrane, which apparently increased the amount of mucus secreted and thereby lessened the effectiveness of subsequent administrations.

Realizing that by this method the absorption was occurring in waves rather than continuously, and bearing in mind the changes produced in the nostrils, we revised our technic by increasing to 20 minims the amount of pituitrin on a single pledget and applying it to one nostril only. At the end of one hour, or at most two hours, the pledget was withdrawn, and a fresh one applied to the opposite nostril for a similar period of time. This not only allowed each nostril a period of rest, but also gave the patient one free nasal passage for breathing, thereby diminishing the discomfort and assuring her more active cooperation. No marked changes were observed in the nasal mucous membrane following repeated applications of pituitary extract. In some cases there appeared to be temporary shrinking, but this was not constant. A number of patients experienced, however, for several hours afterwards, the symptoms of a mild coryza, but no other untoward local effects were observed.

The local conditions of the nostrils are of great importance to the successful outcome in the individual cases. Any abnormal condition, such as an acute coryza, profuse lacrimation, or a chronic catarrhal inflammation militates against absorption. Even the normal accumulated output of mucus evoked by the presence of the cotton pledget becomes sufficient within one to two hours to diminish decidedly the resorption of the drug.

CLINICAL OBSERVATIONS

Up to the present time, we have employed the nasal method of inducing labor in 80 patients, 26 of whom were treated by our original technic and 54 by the improved method just outlined. Since a detailed report of the individual cases seems unnecessary, we shall only summarize our results.

Seven failures occurred in the first series of cases, before our technic had become perfected; whereas but a single failure was noted in the second series. Two factors may possibly be invoked in explanation of this result. First, as was suggested by Watson, an important feature in any method of inducing labor by means of pituitary extract consists in the administration of a second dose before the effect of the first has worn off. Secondly, it seems quite probable that the failure in some of the cases in our first series was due to the fact that only a fraction of pituitary extract was absorbed, as the result of a lack of firmness of application of the pledgets to the inferior turbinate bone.

The following are our indications for the induction of labor:

I Toxemia	32 cases
II Postmaturity	15 cases
III Severe pyelitis	5 cases
IV *Hydramnios*	2 cases
V Dead fetus	2 cases
VI To test the method in normal pregnant women during the last month of pregnancy and at term	24 cases

In groups I-V (56 cases) labor was induced successfully in every instance. On the other hand, nine failures occurred in the sixth group. Here we found that when the cervical canal measured 2 or more cm. in length and the external os was tightly closed, that the chances of success are comparatively poor; while the prospects are much better when the cervical canal is obliterated. This observation is quite in harmony with the results of Knaus' recent experiments which indicate that considerable changes occur in the relationship between the hypophysis and the uterine muscle during pregnancy, and that as the result of an increase in the sensitiveness and the tone of the uterine muscle toward the end of pregnancy, labor can be induced in animals at term by comparatively small doses of pituitrin, which are entirely ineffective before term.

Of the 32 toxemic cases, nine were of the nephritic, 17 of the preeclamptic, and six of the "vascular" or hypersensitive type (showing excessive high blood pressure associated with but a trace of albumin). In the entire series of toxemic cases, eight were at term, 22 from two to four weeks before term, and two seven months pregnant. It is interesting to note that in none of them did the blood pressure rise materially over the initial level during the course of the induction. Moreover, it is significant that in the preeclamptic cases, labor was induced with the greatest ease, one application of pituitary extract often being sufficient; whereas greater difficulty was encountered in the nephritic cases. The response of the "vascular" type of cases to the pituitary extract was somewhat similar to the observations made in the preeclamptic cases. Although no failure occurred in either group, it was a characteristic feature of the nephritic type that the response was definitely less pronounced. As an illustration, a case may be cited in which we were obliged to resort to the artificial rupture of the membranes after labor had come to a standstill, with the cervix dilated to 3 cm. At this point, it is important to state that the artificial rupture of the waterbag is of great value in bringing to a quick and successful end any induced case which seems about to fail for want of satisfactory pains. As a matter of experience, however, the procedure mentioned was resorted to in only seven out of all our cases. In four preeclamptic cases, there was observed a tendency on the part of the uterus to pass into tetanic contraction, which probably indicated that the organ was unusually susceptible to pituitary extract; thus affording a reasonable explanation for the ease with which labor can be induced in this variety of toxemia. Bearing in mind the sensitiveness of preeclamptic patients to pituitary extract, we are now restricting in that type of patient, the initial dose of the drug to 10 drops, adding water to dilute the extract so that both quantity and potency are diminished. Later, if the patient proves less sensitive than we anticipated, the dosage is built up.

In all the postmature cases, labor was successfully induced at the first attempt. Labor was likewise induced without difficulty in two cases (parae VI) of dead fetus in utero, at the ninth month and at term, respectively; in the first case death due to an unknown cause, and in the other, to syphilis.

In conclusion we wish to say that in a few cases, quinine was discarded from the usual preliminary preparation of the patients on account of their idiosyncrasy to this drug. But in these cases, no difference in their response to pituitary extract was noted. Finally, several cases at term were observed where an apparent failure followed the applications of pituitary extract. These patients, however, fell into labor spontaneously in less than twenty-four hours thereafter. Furthermore, it may be mentioned that we have also found the nasal method of application of pituitary extract a safe and efficient procedure for accelerating labor already in progress, although further experience will be necessary before its employment can be standardized.

COMMENT

The fact that in our series all of the babies were born alive, testifies to the control we now possess over the action of pituitary extract when used both for induction of labor and for accelerating labor already in progress. The nasal administration of the drug demands a constant attention for the succeeding twenty minutes. The possibility of withdrawing the drug and thus preventing its further absorption as soon as the uterus passes into tetanic contraction, renders the nasal application of pituitary extract the safest method yet available for obstetric purposes.

REFERENCES

Hofbauer: Centralbl. f. Gynäk., 1911, No. 4; Monatschr. f. Geburtsh. u. Gynäk., 1911; Verh. d. D. Ges. f. Gynäk., 1911; München. med. Wchnschr., 1912, No. 22; Monatschr. f. Geburtsh. u. Gynäk., 1918; Monatschr. f. Geburtsh., xxviii. *Henderson, V. E.:* Jour. Canadian Med. Assn., 1926, xvi, 9. *Guggisberg:* Biologie und Pathologie des Weibes, vii, 1926. *French Committee:* Revue francaise de Gynec. et d'Obst., April, 1925, xx, 10-15. *Blair-Bell:* Brit. Med. Jour., 1925, No. 3362. *Jung:* Zentralbl. f. Gynäk., 1926, No. 48; Schweiz. med. Wchnschr., 1926, No. 46, p. 1130. *Eversmann:* ibidem, 1925. *Stein, A.:* ibidem, 1920, No. 41; Am. Jour. Obst. and Gynec., 1919. *Framm:* Deutsch. med. Wchnschr., 1926, No. 48. *Scott, W. A.:* Am. Jour. Obst. and Gynec., Oct., 1926, xii, 4. *Watson, B. P.:* Tr. Am. Gynec. Soc., 1920; Am. Jour. Obst. and Gynec., 1922, iv. *Williams, J. Whitridge:* Jour. Am. Med. Assn., 1925, lxxxiii, No. 22; Obstetrics, ed. 5. *DeLee:* Principles and Practice of Obstetrics, ed. 4, 1924. *Lash u. Neumayer:* Biochem. Ztschr., 1925, clxxiv, p. 333. *Lash u. Brugel:* Wiener Klin. Wchnschr., 1926, No. 28. *Rowntree:* Jour. Am. Med. Assn., 1924, lxxxiii, 399. *Barker and Mosenthal:* Jour. Urol., 1917, i, 448. *Wolpe:* Berl. Klin. Wchnschr., 1921, v, 101. *Hamill:* Proc. Roy. Soc. Med., Therap., Sec. 17, 1921. *Donaldson:* ibidem, 1921. *Knaus, H. H.:* Brit. Med. Jour., Feb., 1926; Jour. Phys., lxi, 1. *Freund, H. W.:* Monatschr. f. Geburtsh. u. Gynäk., xx. *Abel and Geiling:* Jour. Pharm. and Exp. Therap., 1924, xxii, cccxvii. *Blomgard:* Arch. Int. Med., 1922, xxix, 504. *Flexner, S.:* Jour. Am. Med. Assn., 1910, lv, 1105. *Fliess:* Ztschr. f. Geburtsh. u. Gynäk., xxxvi. *Johnston, J. B.:* Anat. Rec., 1914, viii, 185. *Weed:* Jour. Med. Research 1914, xxi, 21.

OBSERVATIONS ON THE PARIETAL FONTANELLE IN THE NEWBORN AND IN YOUNG INFANTS

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IT IS not unusual to find irregularities of ossification along the course of the parietal portion of the sagittal suture in newborn infants and very young children. These irregularities have been the subject of a number of studies, for they are sometimes of considerable practical importance in obstetrics. The presence of localized and definite enlargements of the parietal portion of the sagittal suture is said to have been noted by Albinus in the eighteenth century, although the first clear description of the parietal fontanelle was given by Gerdy (1837). Subsequent papers touching on this subject were published by Hamy (1871, 1872), Le Courtois (1870), Maggi (1896), Lee (1898, 1899), Frassetto (1900, 1903), and others. The fontanelle has received a number of names, including the parietal fontanelle, the sagittal fontanelle, the accessory sagittal fontanelle, the obeliac fontanelle and the fontanelle of Gerdy, after its supposed discoverer. This fontanelle is not recognized in the B N A terminology.

Studies of the parietal portion of the sagittal suture in early life have been made by two methods: First, by the examination of prepared skulls or fresh skulls at postmortem, and second, by the simple palpation of this region in the living. Both of these methods have certain disadvantages. The first is commonly limited to a small amount of material which is often of uncertain history. The second, as commonly applied, gives no quantitative record of findings.

The present study is based upon the examination of the parietal portion of the sagittal suture of 598 living newborn infants and children of the first and second years. All of these children were full term, healthy infants, and all cases with clinical evidence of rickets were rejected. Otherwise there was no conscious selection of material. These observations were made with the following technic: The child's head was held by an assistant, and the observer passed a strip of closely woven linen cloth, approximately 4 cm. wide and 20 cm. long, over the sagittal arc of the cranium, from the forehead to the occiput. While this strip was held firmly in place the fontanelles and sagittal suture were palpated through it, and their outlines traced upon it with an indelible pencil. The record was completed by noting the child's age, sex, weight and total crown-heel length on the strip. After a little practice this method was found to be a fairly accurate one, and the outlines of the fontanelles thus obtained could be measured with considerable precision. Our findings from these data may be summarized as follows:

TABLE I. FREQUENCY OF THE PARIETAL FONTANELLE IN INFANCY

RANGE IN AGE (DAYS)	TOTAL NUMBER OF CASES OBSERVED	NUMBER OF CASES SHOWING DEFINITE ENLARGEMENTS OF PARIETAL PORTION OF SAGITTAL SUTURE	PERCENTAGE OF CASES SHOWING DEFINITE ENLARGEMENTS OF PARIETAL PORTION OF SAGITTAL SUTURE
0 to 30	241	74	30.70
30 to 60	90	25	27.78
60 to 90	30	4	13.33
90 to 180	83	1	1.20
180 to 270	59	0	0.00
270 to 360	47	0	0.00
360 and over	48	0	0.00
Totals and means	598	104	17.39

I. FREQUENCY

Table I shows a frequency of interparietal spaces. Definite localized enlargements of the interparietal suture were found in 104 of the 550 infants of the first year which we examined, a frequency of 18.9 per cent. In the first month this frequency was 30.7 per cent, in the second month 27.8 per cent, in the third month 13.3 per cent, and in the second trimester (90 to 180 days) 1.2 per cent. These frequencies are much higher than any reported by previous observers. Le Courtois (1870) states that the space was present in 5 of the 175 newborn infants he examined, a frequency of 2.9 per cent. Lee (1899) who examined 500 living newborn infants, found a definite parietal fontanelle in 22 instances, or 4.4 per cent, but it is evident that this observer threw out a number of individuals with small parietal fontanelles, for he remarks that, "In each of these cases a well-marked membranous space was present. Cases which showed only a notch in the parietal bone in this region were more frequent, and were not included in this table." The comments following the presentation of Lee's paper, however (which are printed in conjunction with the paper in the *Transactions of the Obstetrical Society of London*), indicate that most of his hearers regarded this frequency as higher than they had encountered in practice. Williams (1923) also considers the percentage of 4.4 as above the normal, and estimates the usual frequency at about 1 per cent in mature newborn children.

It seems probable that the discrepancy between our figures and those of other observers lies largely in the definition of the term "fontanelle." Most obstetricians seem to have limited this term to the designation of spaces of sufficient size to be of practical importance in midwifery, while we have applied it to all definite membranous spaces along the course of the parietal portion of the sagittal suture, regardless of their size. If we limit the count in our series to spaces having an area of 1 square centimeter or more, which perhaps approximates the size of a fontanelle as definitely palpated by the index finger, the number for the first year falls to 18, or approximately 3.27 per cent of the total number of cases for this period. The percentage of cases with palpable fontanelles similarly estimated for the first month is 5.8, and for the two succeeding months it is 3.3 in each. These figures are not very different from those reported by Lee. It is hardly possible that the greater frequency of this fontanelle which we have encountered is due to our technic, for we find that our measurements of the great or frontal fontanelle made by this method are somewhat smaller than those of other observers, who have employed the method of palpation and direct measurement upon the head of the living child.

II. SIZE AND INVOLUTION

As shown in Table I, there is a constant postnatal involution of this fontanelle, as indicated by its frequency in groups of unselected cases in graded time intervals. Although the relative frequency in the second month is but slightly less than in the first, it is less than half as great in the third month and is but 1.2 per cent of all cases of the second trimester of postnatal life. We encountered no instances of this fontanelle in the 154 children over six months of age which we examined. That the parietal fontanelle may occasionally exist beyond the close of the second trimester is indicated by Lee's findings, for this author noted two instances of fontanelles between six months and one year.

The fontanelle is so irregular in outline that lineal measurements of it have little value. It is possible, however, to estimate the area in many instances. We were able to make this determination for 67 of the 104 tracings in our series. In the other 37, the space was confluent with other fontanelles or the outline of the tracing was not sufficiently sharp to allow accurate measurement. The areal determinations were made directly from the fontanicular tracings with an Amsler polar planimeter. The values thus obtained are shown in Tables II and III.

The average area of the measurable tracings of infants of the first month is 0.14 square cm., and the mean value for the second month is 0.13 square cm. There were only 2 measurable tracings of children over two months of age and these had a mean value of 0.09 square cm. There is a constant decrease in the maximal areas of the fontanelle in the first trimester.

TABLE II. FREQUENCY OF PARIETAL FONTANELLES OF ONE SQUARE CENTIMETER OR OVER IN AREA

RANGE IN AGE (DAYS)	TOTAL NUMBER OF CASES OBSERVED	NUMBER OF PARIETAL FONTANELLES 1 SQ. CM. OR OVER IN AREA	PERCENTAGE FREQUENCY OF PARIETAL FONTANELLES 1 SQ. CM. OR OVER IN AREA
0 to 30	241	14	5.81
30 to 60	90	3	3.33
60 to 90	30	1	3.33
90 and over	237	0	0.00
Total and mean	598	18	3.01

TABLE III. AREA OF THE PARIETAL FONTANELLE IN MEASURABLE CASES

RANGE IN AGE (DAYS)	TOTAL NUMBER OF CASES OBSERVED	TOTAL NUMBER OF CASES SHOWING PARIETAL FONTANELLES	TOTAL NUMBER OF CASES WITH MEASURABLE PARIETAL FONTANELLES	AREAS OF MEASURABLE PARIETAL FONTANELLES (SQUARE CM.) MEAN	MAXIMUM
0 to 30	241	74	53	0.14	0.55
30 to 60	90	25	12	0.13	0.25
60 and over	267	5	2	0.09	0.15
Totals and means	598	104	67	0.137	

We were able to secure a few cases in which we could trace the fontanelle for a considerable period in the same individual. Three of these cases showing the involution of the space are illustrated in the tracings forming Fig. 4.

III. FORM AND POSITION

The form of the fontanelle is highly variable. While usually ovoid or diamond shaped in outline, a variety of bizarre shapes are encountered. Confluence with the frontal fontanelle, or the occipital fontanelle is not unusual. Typical outlines of the parietal fontanelle are shown in the tracings forming Figs. 1 and 2. Unilateral fontanelles, indenting but one parietal bone, are not uncommon. We encountered 11 in the series of 104 fontanelles (10.6 per cent). Duplications of the parietal fontanelle, likewise, are not particularly unusual. They were present in 16, or 15.4 per cent, of our series. In one instance there were three parietal fontanelles present. These duplications may be either confluent or may be separated by considerable segments of the sagittal suture along which the medial margins of the parietal bones are approximated. Rauber (1906) has noted similar duplications of the metopic fontanelle in the frontal portion of the sagittal suture.

It is generally stated that the fontanelle is located rather constantly at the level of the parietal eminences. While we have found this position to be the rule, the presence of this space in other segments of the parietal portion of the sagittal suture is not particularly uncommon.

IV. GENESIS

The origin of this fontanelle has been explained in two ways. It has been suggested that it is due to the local "suppression" of bony trabeculae radiating from a single ossification center located in the position of the parietal eminence, but no adequate theory of the cause of this suppression has been offered.

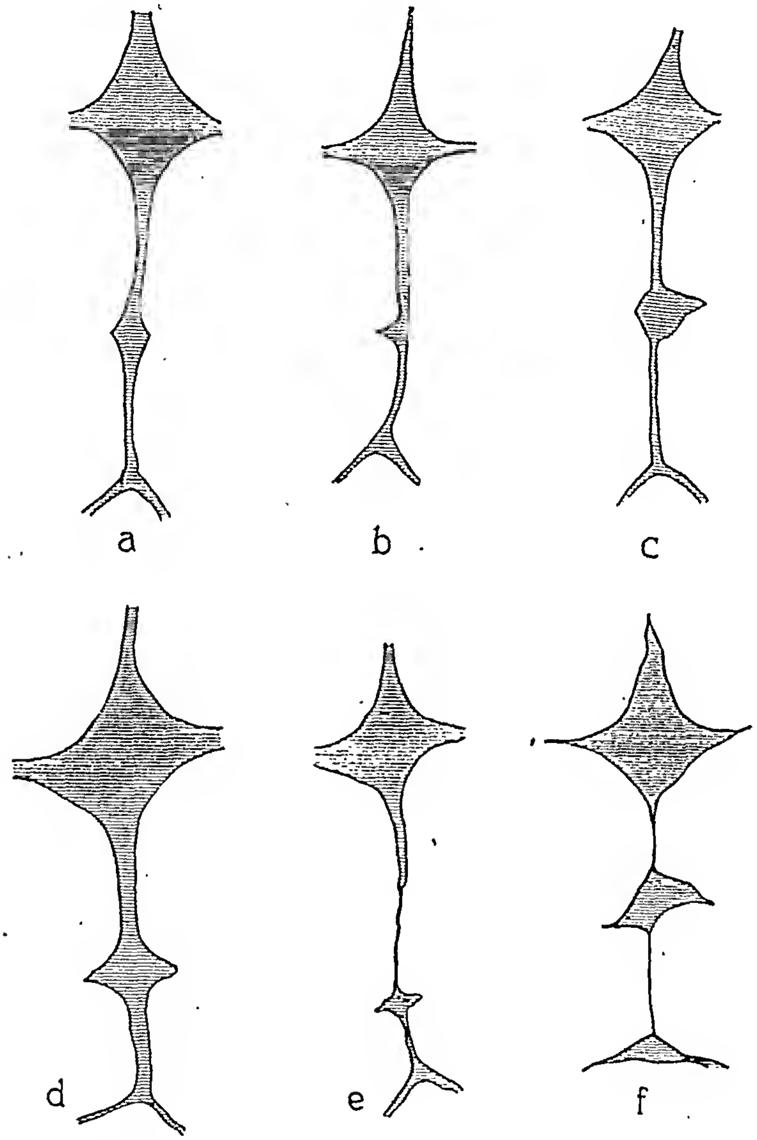

Fig. 1.—A series of tracings of the parietal portion of the sagittal suture showing typical parietal fontanelles. (*a*), Female, 34 days old; (*b*), female, 3 days old; (*c*), female, 7 days old; (*d*), female, 5 days old; (*e*), male, 36 days old; (*f*), newborn female.

A second explanation is that presented by Frassetto in connection with his theory of the fontanelles. Frassetto points out that, in theory, fontanelles may be expected at any point on the brain case which is equidistant from three or more ossification centers. Each such point forms a focus at which the margins of bones growing from these ossification centers may be expected to make their final contacts, and,

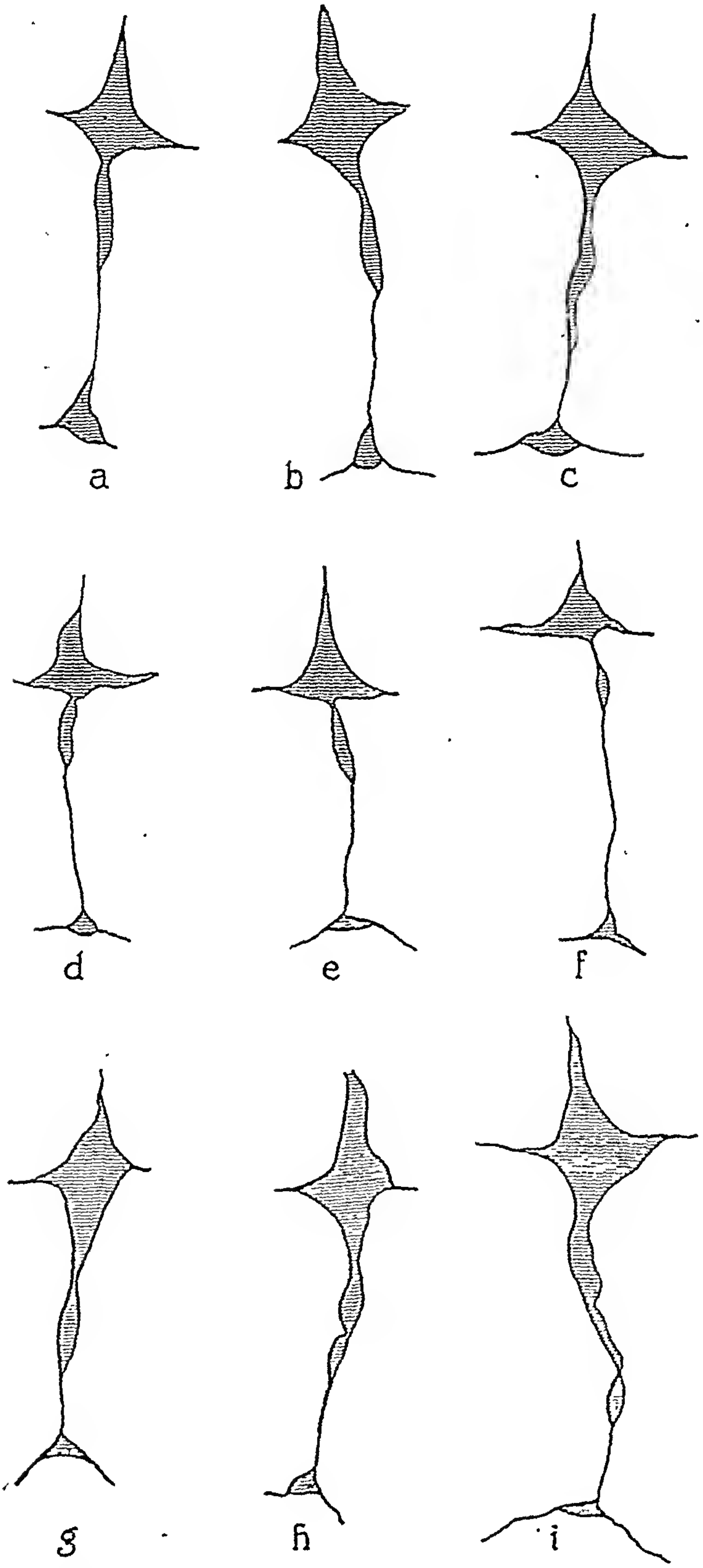

Fig. 2.—A series of typical tracings of the parietal portion of the sagittal suture showing a series of parietal fontanelles which were presumably formed by extensions of the great or frontal fontanelle. (*a*), Male, 30 days old; (*b*), newborn female; (*c*), female, 15 days old; (*d*), newborn male; (*e*), newborn female; (*f*), female, 24 days old;(*g*), male, 25 days old; (*h*), newborn female; (*i*), male, 28 days old.

prior to the time of making these contacts, an unossified area or fontanelle would occupy this position. He locates 27 such points on the human cranium and finds that constant or occasional fontanelles have been found at 22 of these positions.

According to this theory, parietal fontanelles would be formed whenever there is an anteroposterior duplication of the parietal ossification center, and when these centers remain separate for any considerable period. Such duplications of the parietal center are quite common, according to the studies of Toldt (1882) and others.

It seems very likely that a certain number of the parietal fontanelles do arise in this fashion for many of our tracings of these spaces have sharp-cut, diamond-shaped outlines which might be expected to occur when four bony margins approach one another and are growing towards a common focus. Others are sharply triangular in shape, suggesting approximation of three such margins. The first class may be regarded as representing instances in which the parietal ossification center was duplicated on both sides, and the second class those in which the parietal center was duplicated on one side only. Examples of fontanelles which may have had this origin are shown in Fig. 1.

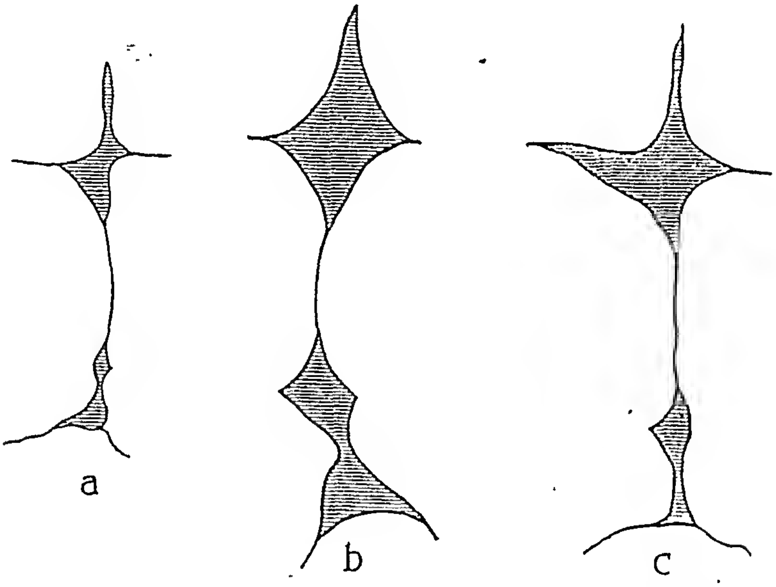

Fig. 3.—A series of tracings of the parietal portion of the sagittal suture, showing parietal fontanelles which are continuous with the occipital fontanelle. (*a*), Male, 18 days old; (*b*), female, 5 days old; (*c*), male, 24 days old.

A certain proportion of these fontanelles, however, appears to arise in a quite different way, by cutting off of posterior extensions of the great or frontal fontanelle. The origin of these cases may be compared with that described by Schultz (1918) for the origin of the metopic fontanelle from anterior extensions of the frontal one. This origin, by extension and isolation of the posterior part of the frontal fontanelle, can be easily demonstrated in an extensive series of trac-

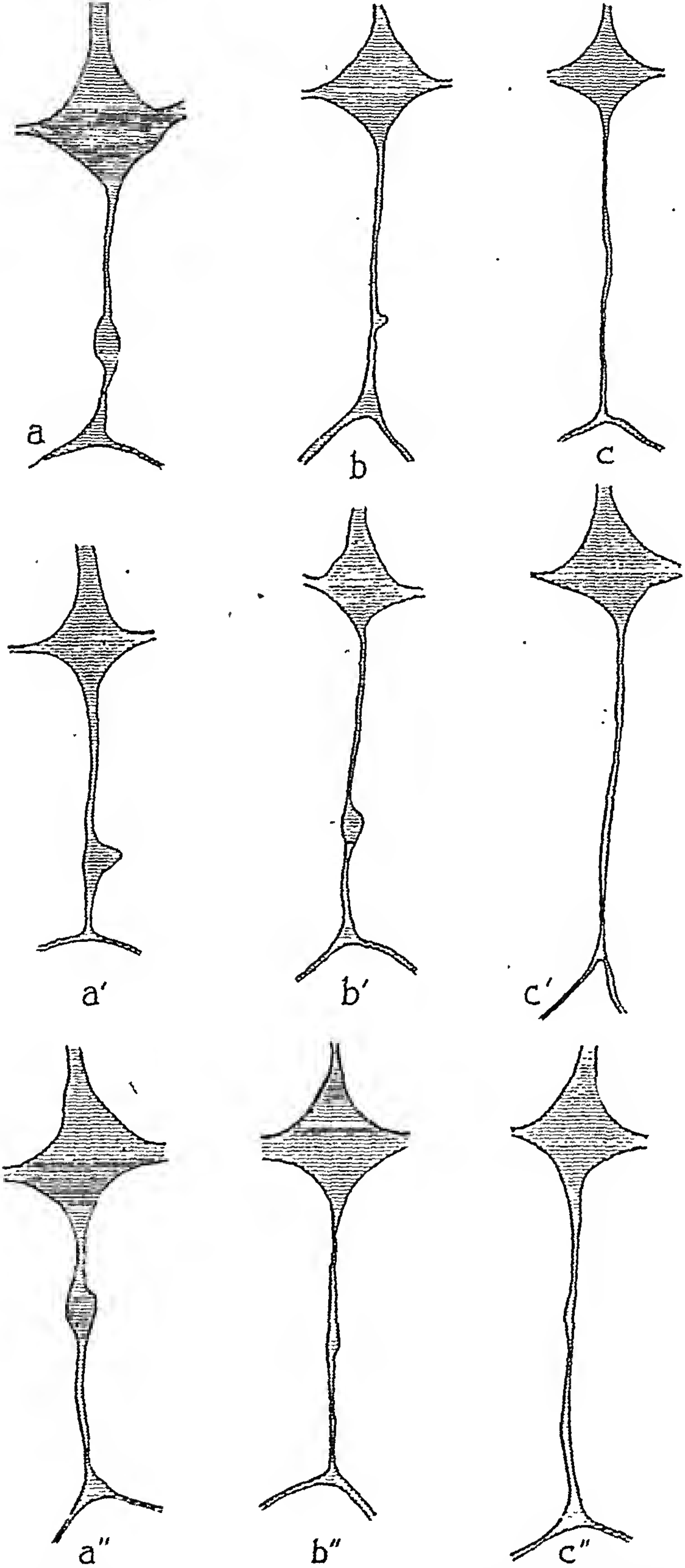

Fig. 4.—Three series of tracings showing the involution of the parietal fontanelle. (*a*), Female, 31 days old; (*b*), the same child at 82 days; (*c*), the same child at 140 days; (*a′*), female, 40 days old; (*b′*), the same child at 62 days; (*c′*), the same child at 140 days; (*a″*), male, 39 days old; (*b″*), the same child at 100 days; (*c″*), the same child at 180 days.

ings of the parietal region in early infancy, for all gradations are found from rather typical frontal fontanelles with posterior prolongations into the interparietal region to instances in which the frontal and parietal fontanelles are completely separated. Fig. 2 shows 9 examples

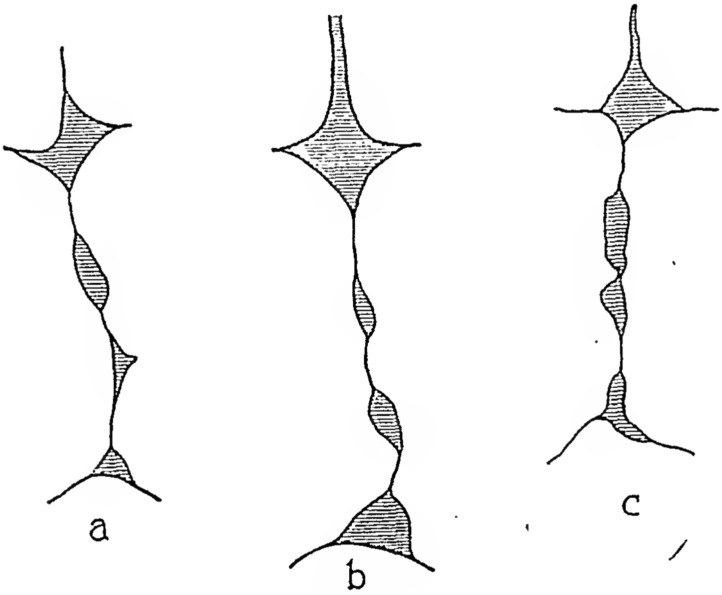

Fig. 5.—Three tracings of the parietal portion of the sagittal suture showing duplications of the parietal fontanelle. (*a*), Newborn male; (*b*), newborn male; (*c*), female, 28 days old.

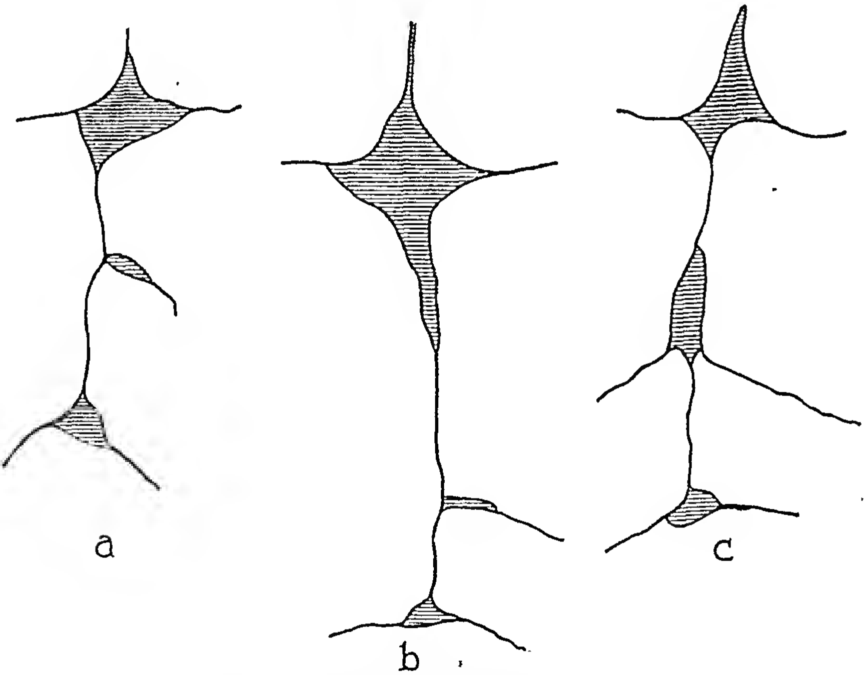

Fig. 6.—Three tracings of the parietal portion of the saggital suture showing parietal fontanelles associated with fissures of the parietal bone. (*a*), Female, 30 days old; (*b*), male, 17 days old; (*c*), female, 21 days old.

of fontanelles which appear to be either formed, or in the process of formation by this method. In our series of 104 tracings of parietal fontanelles we found 16, or approximately 15.4 per cent, which seem to have arisen from posterior extensions of the great or frontal fontanelle. In fact the number may have been much higher, since it is impossible to determine the origin of fontanelles which are almost obliterated and have lost their characteristic form and connections.

We have not been able to determine with certainty whether the fontanelle may arise by anterior extension from the occipital fontanelle, as well as by posterior extension from the frontal one. In three instances, which are illustrated in Fig. 3, the parietal fontanelle was confluent with the occipital one, but in all of these cases the parietal fontanelle had the rather sharp angles which seem characteristic of those fontanelles which arise through duplication of the parietal center of ossification. Certainly if parietal fontanelles arise through the anterior extensions of the occipital bone, the number thus formed must be relatively small.

V. ASSOCIATION OF THE PARIETAL FONTANELLES WITH CLEFTS OF THE PARIETAL BONE

Several observers have noted instances in which parietal fontanelles were associated with partial or complete subdivisions of the parietal bone. We observed four such cases in this series. Three of these are shown in Fig. 6. In only one instance did the cleft appear to be a complete one, and in only one instance was it bilateral. In the three unilateral cases noted, the cleft was incomplete and involved only the right parietal bone. We did not find any fontanicular bones in the series of infants examined but it is quite possible that the technic employed would not distinguish these structures if they were present.

RÉSUMÉ

1. The relative frequency of interparietal spaces as determined from a study of 598 healthy living children is 30.7 per cent for the first month after birth, 27.8 for the second month, 13.3 per cent for the third month and 18.9 per cent for the entire first year.

2. The relative frequency of interparietal spaces or parietal fontanelles of 1 square centimeter or over in area, in this series of cases, is 5.81 per cent for the first month after birth and 3.33 per cent for the second and third months.

3. The persistence of the parietal fontanelle after the first trimester is unusual. We found only one instance in our cases of the second trimester and none thereafter.

4. The average area of the parietal fontanelle (in measurable cases) for the first trimester of postnatal life is 0.14 square centimeters in this series.

5. The form of the parietal fontanelle is highly variable. The parietal fontanelle is often confluent with the frontal fontanelle, and

occasionally with the occipital fontanelle. Duplications of the parietal fontanelle are not unusual.

6. Although the parietal fontanelle is usually located at the level of the parietal eminences, it may occur at any place along the interparietal portion of the sagittal suture.

7. Certain of the parietal fontanelles probably have their origin from duplications of the parietal ossification centers, but we think that a number are formed from posterior extensions of the great or frontal fontanelle. A few parietal fontanelles may arise from anterior extension of the occipital fontanelle.

REFERENCES

Bianchi, S.: Arch. Ital. d. Anat. e Embriol., 1903, ii. *Frassetto, F.:* L'Anthropologie, 1902, xiii, 209-218; Riv. d. Sc. Biol., Torino, 1900, ii, 64; Ann. d. Sc. Nat., Zoologie, 1903, Sér. 8, xvii, 143-363. *Gerdy, J. V.:* Recherches et propositions l'anatomie, de pathologie et de tocologie, 1837, Thése, Paris, 48 pp. *Giuffrida-Ruggeri, V.:* Monit. Zool. Ital., 1904, xv, 173-178. *Hamy, E. T.:* Fontanelles anormales du crane humain, Paris, 1871; Arch. per l'Anterpol. e l'Etnol., 1872, ii, 1-10. *Hrdlicka, A.:* Bull. Am. Museum of Nat. Hist., 1903, xix, 231-386. *Le Courtois, E.:* Essai sur l'anatomie de la voûte du crane pendant les periodes embryonnaires, foetale et infantile, Thése, Paris, 1870. *Le Double, A. F.:* Traité des variations des os du crane de l'homme, Paris. *Lee, A.:* Lancet, 1898, p. 147; Tr. Obst. Soc. London, 1899, xl, (1898) 263-269. *Maggi, L.:* Rend. d. R. Inst. Lombardi d. Sc. e. Lett., 1896, Ser, 2, xxix. *Rauber, A.:* Morphol. Jahrb., 1906, xxxv, 354-361. *Schultz, A. H.:* Am. Jour. Anat., 1918, xxiii, 259-271; Jour. of Mammalogy, 1923, iv, 65-77. *Schwalbe, G.:* Ztschr. f. Morphol. u. Anthropol., 1901, iii, 93-129; Anat. Anz., 1903, xxiii, 1-11. *Toldt, C.:* In Maschka: Handb. d. gerichtl. Medicin, 1882, iii, 483-585. *Williams, J. W.:* Obstetrics, 1923, ed. 5, New York, p. 165.

A STUDY OF THE INFANT'S BIRTH-WEIGHT AND THE MOTHER'S GAIN DURING PREGNANCY*

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A GROWING tendency to emphasize the value of competent medical supervision during pregnancy finds full justification in the excellent results thus obtained, as compared with the less satisfactory outcome when this period has been treated indifferently, or neglected altogether. Indeed, familiar studies from many sources uniformly confirm the benefits of "prenatal care" which merely means suitable directions for the maintenance of health and periodic observations to detect promptly the signs and the symptoms of approaching complications. Some of these complications relate to autointoxication arising from disordered metabolism and from that standpoint, everyone agrees, the prospective mother should receive specific advice regarding her diet. Beyond this, however, it is still a question whether the diet to be used in pregnancy merits attention. Some obstetricians regard the appetite as a trustworthy guide; others advise their patients to eat much less than they would naturally enjoy. The latter group believes that some relationship exists between the mother's consumption of food and the weight of her baby at birth. And, a baby of moderate size, they insist, favors the mother's welfare sufficiently to justify moderation in her diet.

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Of course, nothing is more characteristic of pregnancy than the fact that it is a period of growth. The germ cells contributed by the parents contain an exquisitely small amount of material; after fertilization, normal progress requires the acquisition of suitable amounts of the foodstuffs. In oviparous animals the supply of nutriment for the development of the embryo has been stored in the egg and the quantity of material, thus provided, may not be subsequently changed. In the case of mammals, however, the material for embryonic development passes gradually and continually from the mother throughout gestation. Not unlikely with this arrangement, the maternal supply of nutriment may be influenced by conditions that affect her from time to time during this period. On theoretic grounds, at least, when the mother has been favored with respect to good health, sedentary habits and a plentiful supply of food a larger fetus would be expected than if the opposite conditions prevailed. Contrasts of this kind have actually been observed by physicians who practice among the well-to-do and who also give their services to clinics provided for the poor.

When life was simpler, perhaps, the proper diet during pregnancy was safely left to the mother's appetite. Now, unfavorable influences have come into play, influences which in our own country at least include the temptations of the soda fountain and the sweet shop. Whatever the correct explanation for the current situation, it is desirable at present that the directions given for the maintenance of health during pregnancy should include definite advice relative both to the kind of food and the quantity of it that is wholesome. It is impractical, of course, to control rigidly the diet of the average obstetric patient, as is done for example in cases of diabetes, for it is neither necessary nor desirable in uncomplicated pregnancy to restrict the diet unduly. If the gain in weight is observed systematically through the course of pregnancy, the food-consumption may be fairly regulated. The use of the scales, always of the greatest interest to the patient, frequently serves more effectively to secure her cooperation toward a proper way of living than do the routine examination of the urine and the regular observation of the blood pressure. Thus, watchfulness of the weight during pregnancy becomes of the very first importance; there is, in fact, no more helpful feature of the routine conference which should be held never less than once a month from early pregnancy until full term is reached.

It is a matter of common experience that patients who take on weight excessively during pregnancy are prone to difficult labors. Generally, this result is attributable to overgrowth of the fetus and in such circumstances the hazard for the baby also becomes appreciably greater. Some method of control here would serve to simplify the problems of parturition and naturally this has been sought from time to time, most frequently by one modification or another of the mother's diet. The results are difficult to interpret for various reasons, but chiefly because one seldom knows whether the diet prescribed has been conscientiously followed. Obviously, then, it is hazardous to advocate a specific diet and we would make it clear that we do not do so. It is not unlikely that similar results would follow the use of some menu, other than the one we have employed. What we desire to emphasize is merely that care be taken to prevent the gaining of too much weight.

The normal increase of weight during pregnancy attributable to the product of conception amounts approximately to 12 pounds, distributed as follows: the fetus 7 pounds, the placenta 1½ pounds, the amniotic fluid 1½ pounds, the uterus 2 pounds. Inevitably, too, the mother's blood increases in quantity, her breasts enlarge and her tissues become more or less edematous; together these factors probably amount to 3 pounds. On this basis, pregnancy may be said normally to cause a total gain of approximately 15 pounds. If the gain be held to this point, the mother's body later, when the involution phenomena of the puerperium are completed, will return to its accustomed weight. In cases where there is a small gain, no gain at all, or an actual loss, it is certain that the mother's own tissues supply the fetus with more or less of the material normally provided by her food. On the other hand, if the gain during pregnancy be excessive it can mean only that the mother's body has increased its reserve, specifically fat, which not infrequently proves a source of dissatisfaction to the owner. This fact, fully appreciated by the laity, places in the hands of the obstetrician a potent argument which will influence his clientele to avoid gaining weight unnecessarily.

With only occasional exceptions the fluctuations of the weight during pregnancy have a definite trend and are productive of a characteristic curve. Typically, there is a drop of several pounds during the first two months which is followed by a period of stationary weight, or of slight increase, for two or three months more. Then, just about the time of quickening, a sense of well-being is experienced with hearty appetite and good digestion. Therefore, the last four to five months of pregnancy are attended with a rapid and consistent growth accurately reflected by the scales. The latter half of pregnancy is the time when excessive gains are likely to occur and watchfulness becomes indispensable. The appetite, as has been said, proves an untrustworthy guide. Neither will previous experience with a given menu that served to keep the individual at a constant weight be useful, for during pregnancy the body handles food more economically. A diet adequate to meet precisely all the bodily needs and preserve the weight in equilibrium beforehand will not only be ample for the needs of pregnancy but will actually cause the gain just described as characteristic of the latter months.

In the directions given patients regarding their diet, after recommending a generous amount of water we find it helpful to stress the benefit of eating frequently and not taking a heavy meal at any time. For obvious reasons, we recommend the elimination from the diet of candy, cake, pastry, pie and other rich desserts. Milk may be taken at will in the early months and of course it proves indispensable in the latter months should a *toxemia* arise. But, for *normal cases*, during the period of notable growth, milk, as a beverage, is too fattening. Consequently, after quickening is experienced our patients are advised not to drink milk. As a routine for the latter half of pregnancy, the diet is arranged as follows:

Breakfast: Coffee or tea with toast and very little butter.
Mid-morning: A cereal with milk, no cream.
Luncheon: Bread with an egg, or soup, or salad.
Mid-afternoon: Orange juice, tea, or bouillon and crackers.
Dinner: One chop or the equivalent of some other meat; two vegetables, in moderate quantity and without a second helping; a simple dessert, preferably fruit.

The diet, just outlined, represents approximately 2000 calories and meets the physiologic requirements of the average patient. There are exceptional cases, of course, which benefit by different directions, but the underlying principle of having food frequently though always in small quantity has been adhered to consistently. As a matter of experience, we know the menu described contains ample vitamines and calcium, two dietary factors that now give the pediatrician some anxiety lest a defective antenatal régime become responsible for some of the nutritional disorders of infancy.

Now, as would be expected, uniform results have not been obtained. As far as possible, the diet has been made a constant factor but human frailty had to be contended with not infrequently, and none of the patients, we believe, would have succeeded in regulating the diet properly unless definite appointments had been given them for observing the weight, as well as other phenomena, and for the discussion of pertinent problems. Among the 500 consecutive cases studied a few individuals, already overweight, who accepted the opportunity to diet conscientiously, succeeded in avoiding any gain whatever during pregnancy; rarely they accomplished a slight loss. For the entire series the average gain in the mother's weight was 16½ pounds and the average weight of the infant 7¼ pounds.

The material collected may be analyzed from various standpoints, but for the present purpose, no criterion of classification seems more logical than the infant's weight at birth. On this basis six groups have been established. (1) The fetal weight was between 5 and 6 pounds in 34 cases. (2) Between 6 and 7 pounds in 132 cases. (3) Between 7 and 8 pounds in 205 cases. (4) Between 8 and 9 pounds in 107 cases. (5) Between 9 and 10 pounds in 19 cases. (6) Over 10 pounds in 3 cases. The heaviest baby weighed ten pounds, one-half ounce. There were two other members of the "over-10-pound-group" but these were cases of twins, in one of which the combined weights amounted to 12 pounds, 6 ounces and in the other to 12 pounds, 5 ounces.

WEIGHT OF INFANT	NUMBER OF CASES	PER CENT OF SERIES	AVERAGE GAIN OF MOTHER
5 to 6 pounds	34	6.8%	11 pounds
6 to 7 "	132	26.4%	14 "
7 to 8 "	205	41.0%	17 "
8 to 9 "	107	21.4%	10 "
9 to 10 "	19	3.8%	24 "
Over 10 "	3	0.6%	26 "

In roundly 90 per cent of the series (444 cases) the weight of the baby fell between 6 and 9 pounds. This incidence implies that scrawny babies, sometimes a bug-a-boo with faint-hearted converts to the principle of maternal diet-control, are rarely to be expected. Moreover, this view is confirmed by the fact that there was only a small group, namely 34 cases (6.8 per cent), in which the infant's weight fell below 6 pounds. On the other hand, and of greater practical moment, the effectiveness of recommending a restricted diet is exemplified by the number of cases in which the baby-weight exceeded 9 pounds; of these there were 20, or 3.8 per cent of the series. The infrequency of large babies, impressive as it is, requires a word of comment. In some instances the etiologic factor may have been a pregnancy prolonged somewhat beyond term; but ordinarily lax cooperation on the part of the patient was responsible, for reference to their records generally disclosed their admission that they were overeating.

As one would expect, there has been considerable variation in the weight gained by different individuals. In exceptional cases, as has been said, there was no gain at all or even a slight loss. Not a few patients were able to hold the gain at 15 pounds, estimated as the weight attributable to the pregnancy itself. But more often this ideal was exceeded, occasionally by as much as two or three times; and in one instance a gain of 54½ pounds in the mother was associated with a weight of 9¾ pounds on the part of the baby.

The relationship between the mother's gain and the baby's weight stands out clearly when the cases are tabulated. Thus, the average gain in the weight of the mother was as follows: 11 pounds, when the baby weighed from 5 to 6 pounds; 14 pounds, when the baby weighed from 6 to 7; 17 pounds, when the baby weighed from 7 to 8; 18 pounds, when the baby weighed from 8 to 9; 24 pounds, when the baby weighed from 9 to 10; and 26 pounds, when the baby weighed over 10 pounds. In general, then, the weights of the babies at term parallel the gains of the mothers. Exceptions to the rule, however, are encountered. Our records include instances in which the baby has been large though the mother's gain was relatively small; on the other hand, an excessive gain in the mother has occasionally been associated with the birth of an infant of normal size.

"May the baby's weight be accurately regulated by the mother's diet?" To this question the answer is distinctly "No." Besides the quality and the quantity of the food the mother consumes, there are other nutritional factors in the problem, those, for example, pertaining to the utilization of food in the body. This does not signify that it is useless to employ the measures at hand merely because they are imperfect and fail to control the situation completely. Rather, it is advisable to stress the importance of diet-control during pregnancy, because this method represents the only one at command for influencing the size of the fetus.

To recapitulate, the review of this series of cases indicates that diet-control, often accepted hesitatingly and practiced imperfectly by the average patient, does not place in our hands a method of determining precisely what the size of the fetus shall be; but in general it does serve to prevent overgrowth of the fetus. This lessens the hazard of birth-injuries both to the mother and to the infant. Additional benefits, obviously relate to the prevention of maternal toxemias and also to a more satisfactory restoration of the mother's body to its accustomed weight prior to pregnancy. The average gain of the mother, 16½ pounds for the whole series, and the average birth-weight of the infant, 7¼ pounds, represent normal values. For this reason, we conclude that with a few exceptions our efforts to regulate the diet have been successful and that our patients have benefited through adherence to a régime which served toward maintaining the natural course of pregnancy.

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LIVER EXTRACT IN THE TOXEMIAS OF PREGNANCY

Preliminary Report of Fifty Cases

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THE liver extract used in these observations was first prepared by Dr. Ralph H. Major[1] for use in cases of hypertension. The extract is practically free of histamine and produces no contractions in the uteri of virgin guinea pigs. Stoland[2] has found that liver extract per se does not produce uterine contractions. The drug has been shown by Major,[1] MacDonald[3] and James, Laughton and Macallum[4] to have a depressor action. In this series of cases we are led to think that it has in addition a detoxicating property in toxemias of pregnancy.

We first began this work by using the drug in cases of high blood pressure and the results in these cases suggested its use in toxemias of pregnancy with hypertension.

We have used the liver extract in a series of fifty cases. Seven were cases of eclampsia, which will be described later in this report and forty-three were cases of preeclamptic toxemia. We eliminated from this series nineteen cases (all living at present) presenting systolic pressures between 140 mm. and 145 mm. These presented additional symptoms, but lacked the symptom complex necessary to universally class them as true toxemias.

The cases reported represent consecutive cases treated at the Elizabeth Steel Magee Hospital, the University Maternity Dispensary and the Presbyterian Hospital of Pittsburgh, from October 1, 1926, to March 1, 1927.

In reviewing the literature of the past we find varying classifications of toxemias, none of which present clear cut lines of demarcation and for the present it would seem best to use the general term "toxemia" designating in addition the organ or organs bearing the brunt of the unknown toxin.

We have considered as evidence of toxemia the following findings, listed in the order of their importance.

1. Systolic blood pressure 145 mm. or above.
2. Albumin, casts or both in urine.
3. Headaches with sudden onset.
4. Epigastric pain.
5. Edema (of toxic origin).
6. Diminished urinary output.
7. Ocular symptoms.
8. Eyeground findings.
9. Nervous irritability.
10. Abnormal blood chemistry findings of little aid unless accompanied by symptoms.

In our total series, there were eleven cases of nephritis. Three gave definite known history of past nephritis and eight the kidney findings and history suggested a preconceptional nephritis. In this group results were not entirely satisfactory. The remaining (thirty-nine) cases responded promptly to the treatment with liver extract but remissions occurred whenever it was given in quantities below the neutralizing dose, suggesting to us the possible failure of the detoxicating function of the liver in this group. In these cases a drop in blood pressure always occurred, in some instances as much as 75 mm. in a few hours. In no case have we failed to keep the pressure down by the injections, given daily for a few days, then semiweekly and ultimately weekly.

The dose varied with the individual case. In the active eclamptic the extract was given intravenously in doses often of 20 c.c. every fifteen to thirty minutes depending on the drop in blood pressure and the state of coma of the individual. We have given as much as 185 c.c. in the first eighteen-hour period. In the mild or moderately severe cases intramuscular injections were used. No ill effects from the extract were noted.

Liver extract was the only drug used in the treatment of this series except where specifically mentioned in the report of the individual case.

We did not restrict diet or activities excepting in those who showed a blood pressure over 180 mm. In this class a partial or complete rest in bed was required; hot packs and hydrogogue cathartics were not used. Liquid petrolatum was the only medication allowed for constipation.

The rapid abatement of the symptoms is noteworthy. Headaches, dizziness, spots before the eyes, epigastric pain, rapid pulse, nervousness and coma disappeared in the course of a few hours. The edema of the extremities and face disappeared in a few days and did not return as long as adequate dosage was given. The urinary output increased, the albumin decreased in amount and in some cases disappeared entirely. Casts usually disappeared before the albumin. Blood chemistry gradually improved.

Three cases with a definite past history of nephritis did not respond to treatment with liver extract. These cases were put on the routine salt-poor, low-protein diet with magnesium sulphate daily in addition to liver extract. No improvement occurred until after delivery. Their systolic blood pressures were 242 mm., 224 mm., and 196 mm., respectively. The eyegrounds in these cases showed definite albuminuric retinitis; the urine contained large quantities of albumin and casts. The blood nonprotein nitrogen was above normal. The other eight suspected nephritic cases responded only fairly well, blood pressures showed moderate improvement and albumin diminished slightly.

Other symptoms as headache, dizziness, ocular symptoms and edema disappeared.

The eyegrounds were examined by Dr. W. W. Blair. Positive findings were present in the nephritic cases mentioned above. Where beginning edema of the fundi occurred, the results were delayed. Where albuminuric retinitis was present no improvement was seen. Normal fundi were found in the nonnephritis cases, and here the results were rapid and uniformly good.

Blood chemistry, while routinely made, and in most cases repeated, has not as yet furnished us with an index as to the severity of the condition, nor has it enabled us to predict the rapidity of improvement.

In the past we accepted certain evidence of toxemia as an indication for the induction of labor or even cesarean section. The present consecutive series are all continuing their pregnancies, free from toxic symptoms and with normal blood pressures or have gone into labor spontaneously and have been delivered.

CASE 1.—Mrs. O. S., a negress, aged 19, para ii, gestation forty weeks, entered the Magee Hospital, December 28, 1926. At the prenatal visits the systolic pressure did not exceed 124 mm. The urine was negative for casts and albumin. No toxic symptoms were present. On admission to the hospital patient complained of a violent headache, epigastric pain, and pain over the uterus. On inspection patient seemed lethargic and listless. There was very slight edema present over face, hands and lower extremities. The blood pressure was 186/134 mm., pulse 120, temperature 99.4° F. The eyegrounds were negative. At 8 A.M. the patient had a typical eclamptic convulsion lasting five minutes; 10 c.c. of liver extract were given intravenously and repeated every half hour for nine doses. There were three typical eclamptic convulsions at intervals of thirty to forty minutes. The blood pressure dropped to 144/108 mm. The patient was perfectly rational five hours after the first convulsion with a corresponding improvement in all other symptoms.

This patient had a partial premature separation of the placenta and the fetus was stillborn, birth occurring spontaneously four hours after the first convulsion. The urine became albumin- and cast-free within one week and the blood pressure remained around 120 mm. No treatment except liver extract was used in this case.

CASE 2.—Mrs. E. J., a negress, aged 16, primipara, gestation thirty-six weeks, entered Magee Hospital January 6, 1927 at 8 A.M. with a history of awakening at 3 A.M. with a terrific headache followed immediately by convulsions. Her mother stated she had between fifteen and twenty convulsions before admission. On admission the patient was in semicomatose delirious state with slight edema of the lower extremities, blood pressure 168/90 mm., pulse 140, temperature 102.2°. The bladder contained ten ounces of turbid urine, with six grams of albumin and a moderate amount of casts. The patient had three convulsions after admission. A total of 85 c.c. of liver extract were given intravenously in 10 c.c. and 15 c.c. doses at half-hour intervals between 9 A.M. and 2 P.M. Patient became conscious, output of urine increased to two ounces per hour and the symptoms seemed to have cleared up. The blood pressure dropped to 138/84 mm., free of symptoms until 8 P.M. when the blood pressure rose to 166/90 mm. and the patient had another convulsion. Then 20 c.c. of the extract were given intravenously, the blood pressure dropped to 148/90 mm., no more convulsions occurred.

On January 7, 1927 patient was delivered spontaneously at 4 A.M., the fetus dying twenty-four hours later in convulsions (autopsy showed nothing of note in liver, brain, etc.). Patient seemed to be rather irrational at times and finally developed a toxic psychosis. When she left the hospital the urine was free of albumin and casts and the blood pressure within normal limits.

This was the second eclamptic treated and we now feel it would have been well to have continued active treatment and if possible prevented the recurrent convulsion.

CASE 3.—Mrs. W. W., white, primipara, aged 28, gestation twenty-six weeks, entered the Presbyterian Hospital January 9, 1927, 9 P.M. in deep coma. Patient had complained of intense headache and epigastric pain on morning of admittance, first convulsion occurred at her home at 3 P.M. followed by three more. She was then sent to the hospital by her physician and had one convulsion in the ambulance, and another on admission. The eyegrounds were negative. Patient had not voided for twelve hours previous to admission and bladder contained 240 c.c. of reddish black urine, containing sixteen grams of albumin and there was a large quantity of red blood cells and casts present. Slight edema of the hands, face and lower extremities was present. Pulse irregular and around 140, blood pressure 196/130 mm., respirations of Cheyne-Stokes type and cyanosis was present. Twenty c.c. of the extract were given intravenously and 10 c.c. every fifteen to thirty minutes thereafter, a total of 135 c.c. in twelve hours. The patient's mind cleared up six hours after treatment was started. The kidney secretion rose to a total of 2430 c.c. during the first twenty-four hours in the hospital. Fluids were taken by mouth and her condition greatly improved; blood pressure dropped to 128/74 mm. within twelve hours; urine became negative for albumin and casts eight days after treatment was started, blood pressure remaining around 120/70 mm.

Fetal life continued for eighteen days after which heart sounds were not heard and she was delivered of a macerated fetus February 12, 1927. Less than one-third of the placenta was functioning, the remaining portion having been occluded by infarcts.

CASE 4.—Mrs. W. F., a white primipara, aged 21, gestation thirty-eight weeks, entered Magee Hospital January 24, 1927 in labor. Patient first appeared at Clinic on January 19, 1927 with a blood pressure of 132/90 mm. when urine was free of casts and albumin. The patient was delivered spontaneously after a seven hour and fifty minute labor, January 25. In the afternoon she developed an intense headache, but did not report it until after her sight became blurred. Blood pressure at this time was 196/98 mm. Fifteen c.c. of liver extract were given intravenously. Blood pressure then dropped to 124/76 mm., but forty-five minutes later she had a typical eclamptic convulsion. The urine contained four grams of albumin and many granular casts, pulse 144, temperature 100.4°. The blood pressure during the next twenty-four hours varied from 104/48 mm. to 130/74 mm., it being controlled by 185 c.c. of the extract during that period, given intravenously in 10 c.c. to 20 cc. doses. The patient had eighteen typical eclamptic convulsions, the last occurring January 26. Patient began to take fluids by mouth two hours later and during the next twenty-four hours 6400 c.c. of water were taken with an output of 6325 c.c. The blood pressure remained around 128/70 mm. On January 26th at 9 A.M. and 6 P.M., morphine sulphate gr. ¼ was given.

CASE 5.—A para i, aged 21, gestation thirty-eight weeks. At prenatal clinic patient was symptomless, blood pressure not exceeding 118/76 mm. Urine was free of albumin and casts. Entered hospital February 15, 1927 in labor, complaining of headache. Just before delivery of head, patient had an eclamptic convulsion; blood pressure was 142/106 mm. Half hour later blood pressure was 168/104 mm. Second convulsion occurred, an initial dose of 20 c.c. liver extract was given intravenously. Two more convulsions occurred at intervals of thirty minutes. Intravenous injections of 10 c.c. to 15 c.c. were given every fifteen to thirty minutes until blood pressure and symptoms improved. Intervals of injections then increased. A total of 115 c.c. used during the first twelve hour period. The urine contained eight grams of albumin, casts and red blood cells. The eyegrounds were negative, temperature after first convulsion 101°, pulse 122. The blood pressure dropped to around 132/80 mm., consciousness was regained in four hours, urine contained less albumin and in ten days was free of casts and contained only a trace of albumin.

Case 6.—Para v, aged 27, gestation forty weeks or more, entered Magee Hospital February 18, 1927. During prenatal care she presented no toxic symptoms, blood pressure did not exceed 115/68 mm. and urine was free of albumin and casts. Entered the hospital, having carried the fetus beyond the expected date of delivery, with edema of feet, blood pressure 134/74 mm., no other symptoms. February 24 (six days later), patient reported she had a severe headache and slight epigastric pain all night. At 7:30 A.M. she had an eclamptic convulsion. Blood pressure then was 158/120 mm. While taking blood chemistry another convulsion occurred. Twenty c.c. of liver extract were given. The blood pressure dropped to 128/110 mm., after which it varied from 110 mm. to 128 mm. During the twenty-four hours following the first convulsion a total of 115 c.c. liver extract were given in divided doses. Patient went into labor the following day and was delivered of a living child weighing 5040 grams, low forceps being necessary, no anesthetic. Urine contained six grams of albumin, casts and red blood cells. Four days later the urine was free of casts and contained only a trace of albumin. Temperature 99°, pulse 100, eyegrounds negative during convulsions. Morphine sulphate gr. ¼ given immediately after the first convulsion.

Case 7.—Mrs. E. P., white primipara, aged 18, gestation thirty-eight weeks. On February 20, 1927 patient presented generalized edema, dyspnea, blood pressure 174/106 mm., pulse 120, temperature 98.4°, aortic and mitral insufficiency with cardiac decompensation recorded. Symptoms became more pronounced the following two days and at 10:15 P.M. February 22 a convulsion was recorded. Blood pressure 198/0 mm. at 2:20 A.M., February 23rd. Morphine sulphate gr. ¼ was given, the membranes were ruptured by the attending physician to induce labor and patient was delivered under ether anesthesia, by low forceps, at 10:18 A.M., February 23. Urine during this time boiled solid with albumin and contained casts. After delivery blood pressure was 126/0 mm. and she presented a picture of shock. February 24 patient was delirious, blood pressure 188/58 mm., urinary output for preceding twenty-four hours 700 c.c., edema increasing, patient in a mild semicomatose condition. February 25 a convulsion occurred at 10:20 A.M. Patient sunk into a deep coma, blood pressure above 300/0 mm., axillary temperature 105.6°, pulse 140, Cheyne-Stokes respiration. One hour and forty-five minutes later without treatment blood pressure dropped to 114/0 mm. February 25 at 1:30 P.M. we saw patient for *first* time and expressed the opinion she was in a moribund condition and hopeless regardless of the treatment used. We did, however, give her 30 c.c. of liver extract and blood pressure remained around 80 mm. until death at 5:30 P.M. the same day.

SUMMARY

1. Cases of known or suspected preconceptional nephritis were only symptomatically improved after using liver extract.

2. Convulsions did not occur in any treated preeclamptic cases.

3. Improvement always occurred except in the preconceptional nephritic cases.

4. No mortality in this consecutive series except Case No. 7.

5. Eclamptics must be under constant observation and the drug given in doses sufficient to neutralize the toxin present in the individual.

This preliminary report is made with the view of calling this treatment to the attention of our fellow workers, hoping thereby to stimulate the early use of the extract in a large number of cases and permitting an ultimate appraisement of its value.

R. H. Major and J. M. Singleton of the University of Kansas, reported to us that they had used liver extract in three cases of toxemia of pregnancy before we started our work.

We wish to gratefully acknowledge the full cooperation and assistance of Dr. W. W. Blair, Ophthalmologist, Drs. M. Cohen and Arthur Thomas of the Pathological Department, and the house staff of the Magee Hospital as well as the hospital management.

Eli Lilly & Company, Indianapolis, have furnished us with their product of liver extract (Heparmone) for use in this series in quantities and at such times as requested. For this cooperation we are greatly indebted.

REFERENCES

(1) *Major, Ralph H.:* Jour. Am. Med. Assn., July 31, 1926, lxxxvii. (2) *Stoland, O. O.:* Am. Jour. Physiol, 1926, lxxvi, 213. (3) *MacDonald, W. J.:* Proc. Soc. Exper. Biol. Med., 1925, xx, 483; Can. Med. Assn. Jour., July, 1925, xv, 701. (4) *James, A. A., Laughton, N. B., and MacCallum, A. B.:* Am. Jour. Physiol., Jan., 1926, lxxv, 392.

121 University Place.

VAGINAL STERILIZATION, WITH OR WITHOUT VAGINAL HYSTEROTOMY

By Frederick C. Irving, M.D., Boston, Mass.

(From the Department of Obstetrics, Harvard Medical School)

The welfare of certain patients requires that they should not be subjected to the perils of future pregnancies. Such women are those suffering from nephritis, cardiac disease where compensation previously has failed, and active pulmonary tuberculosis. If these individuals should come under observation when an early pregnancy is in progress it is equally advisable that their uteri should be emptied at the same time that sterilization is effected.

The method heretofore employed in our clinic and by many American operators has been to open the abdomen, incise the uterus, evac-

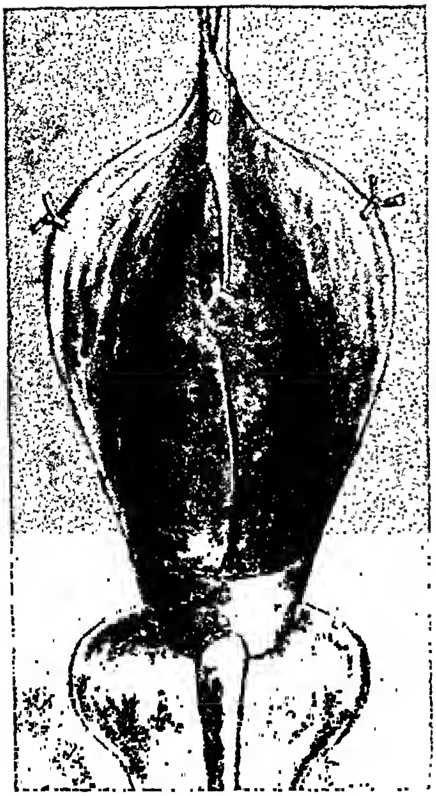

Fig. 1.—The labia minora, if redundant, are sutured to the skin, thus keeping them out of the way. The anterior vaginal wall is opened by the conventional inverted T incision used in vaginal cesarean section.

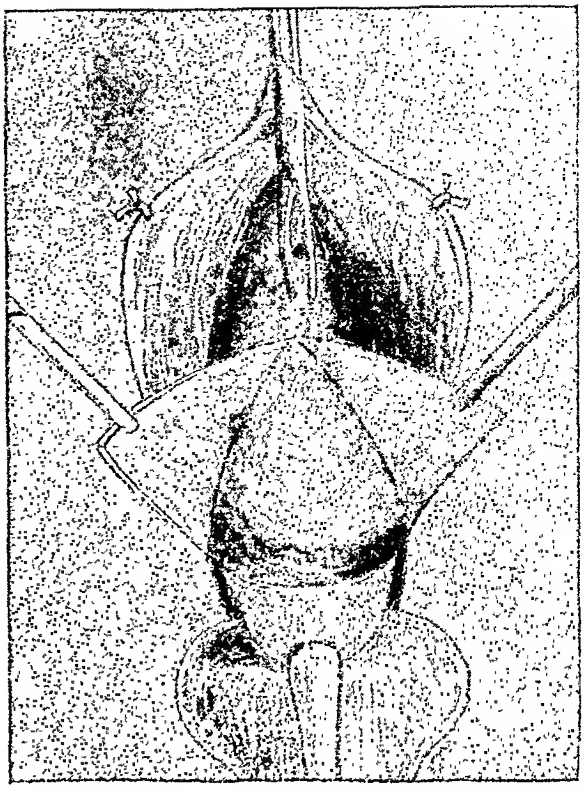

Fig. 2.—The two triangular flaps of vaginal wall formed by the inverted T incision are now reflected outward exposing the bladder.

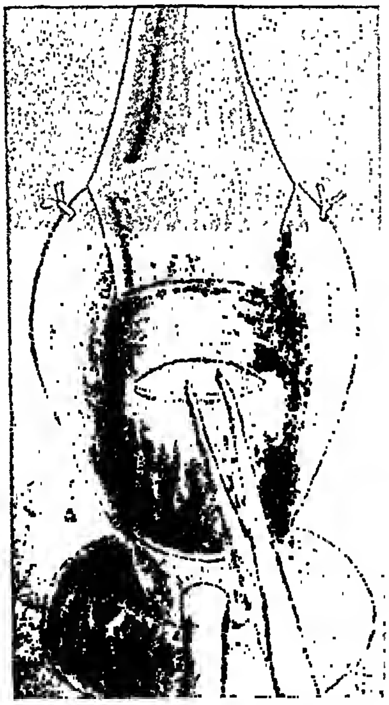

Fig. 3.—The bladder has been separated from the lower uterine segment by scissors and gauze dissection and is held up out of the way by a long bladed vaginal retractor. The uterovesical fold of peritoneum has been identified and opened by a transverse incision, exposing the lower portion of the anterior surface of the uterus which has been grasped with a double tenaculum forceps.

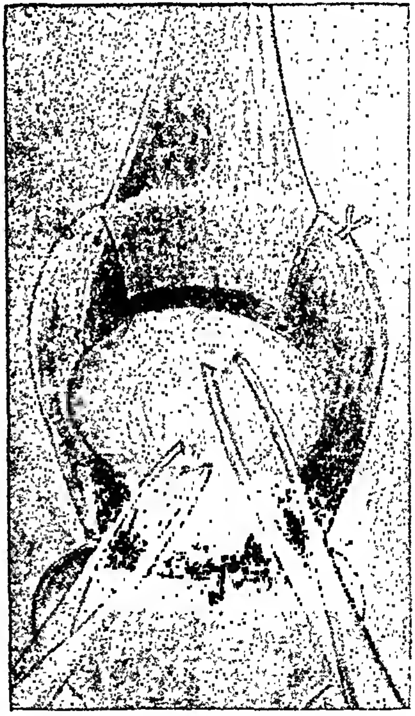

Fig. 4.—The French hooks previously applied to the anterior lip of the cervix have been removed and the cervix replaced in the depths of the vagina so that the fundus of the uterus may be drawn forward through the peritoneal incision. The fundus of the uterus is delivered by traction on the tenaculum forceps, which are placed one above the other in successive bites as more and more of the uterus appears in view.

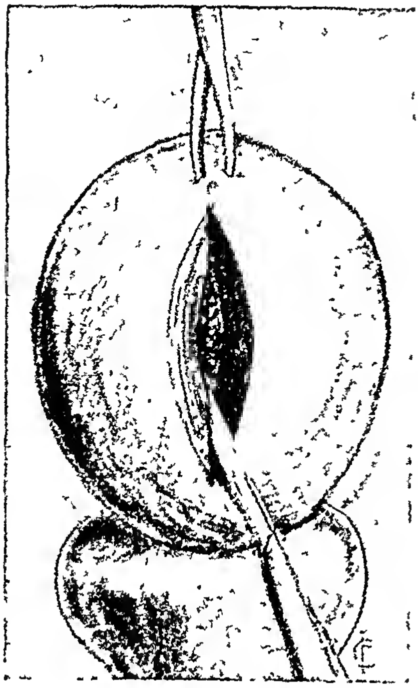

Fig. 5.

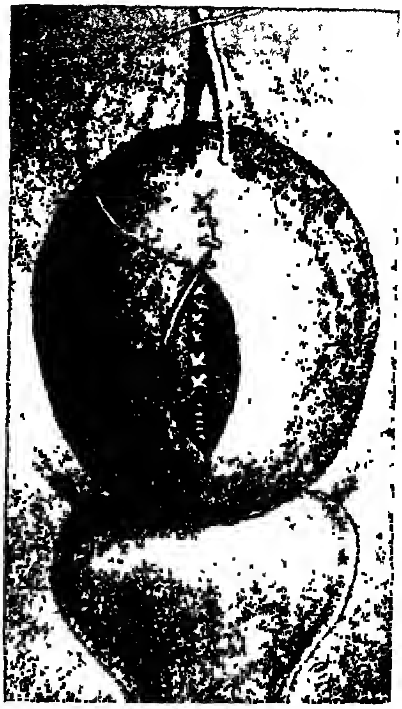

Fig. 6.

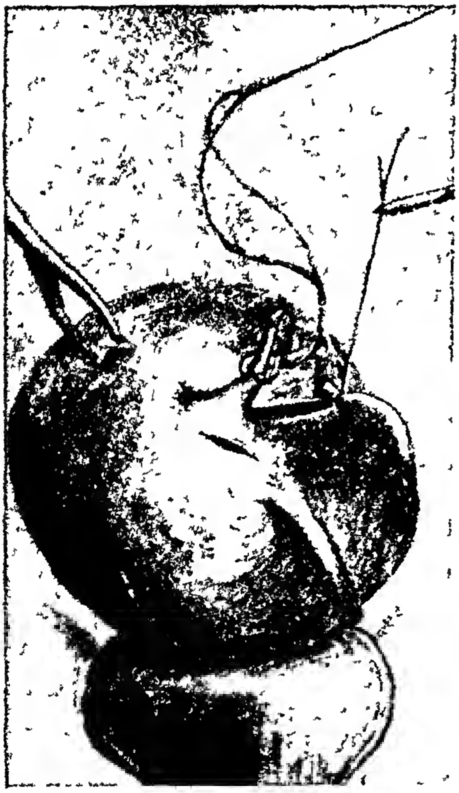

Fig. 7.

Fig. 5.—The anterior surface of the uterus is incised longitudinally and the ovum removed either by the finger or by a large blunt curette.*

Fig. 6.—The uterine incision is now closed in layers with chromic catgut. The deepest layer is continuous, the next, which embraces the bulk of the muscularis, interrupted, and the final, or peritoneal, stitch is of the overlapping continuous variety.

Fig. 7.—The operator now proceeds to sterilize the patient by the method I have devised for the abdominal route. One cornu of the uterus is drawn into view. Both tube and round ligament are identified. The tube is doubly ligated with chromic catgut about 1½ inches from its uterine insertion and divided between the ligatures. The proximal end is dissected free from its mesosalpinx with a sharp knife, keeping close to the tube to avoid bleeding. The loop of a double suture armed with either a straight or a round needle is slipped over the free proximal end of the tube. The tube is now transfixed with the needle proximal to the loop, thus forming a slip noose. A small incision is made anteriorly in the uterine serosa at the base of the tube.

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*Incision of the anterior wall of the uterus above the cervix may be carried out readily as late as the end of the third month of pregnancy. Beyond this date the uterus is best emptied by the classical vaginal *cesarean section* before proceeding to sterilization. According to Kakuschkin the advantage of the supracervical section is that the integrity of the cervix is not destroyed and healing is therefore more satisfactory.

uate its contents, suture it and sterilize the patient by some operation upon the tubes. This procedure is not technically difficult but it carries with it the disadvantages inherent in all laparotomies.

It has seemed to me that with multiparae in whom the pelvic supports were well relaxed, the same results could be obtained by operating through the vagina provided that pregnancy had not advanced far enough to make the operation unduly difficult. The advantage to be thus derived lies in an increased smoothness of convalescence. The same absence of pain, vomiting and distention that one expects after the Watkins-Wertheim interposition operation has characterized the recoveries of the four patients upon whom the writer has recently operated by this method. On the other hand, there is no doubt that the vaginal method is more difficult than the

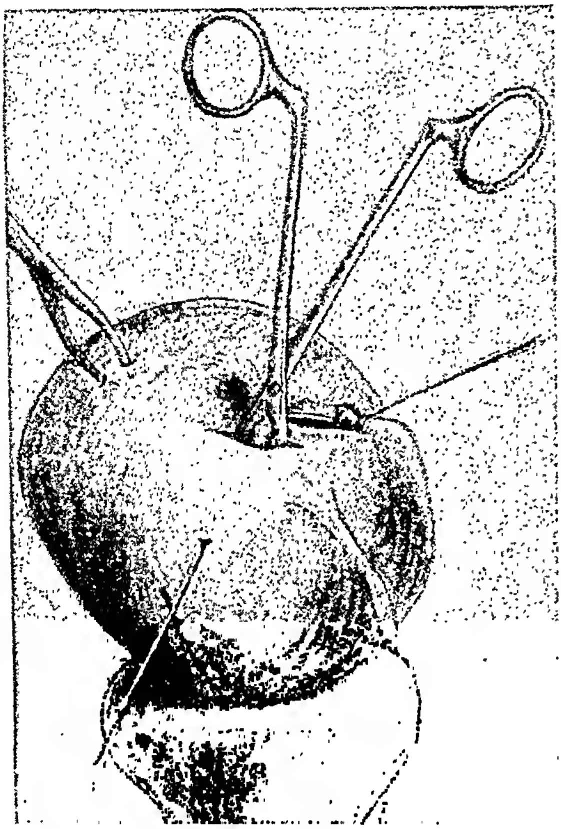

Fig. 8.—A pocket is made in the uterine muscularis by spreading a pointed hemostat. The needle carrying the double suture to which the tube has been attached by the slip noose is passed through the pocket and brought out on the surface of the uterus about an inch distant.

By spreading the mouth of the pocket with the hemostat and by traction on the double suture the proximal end of the tube is buried in the uterine muscularis.

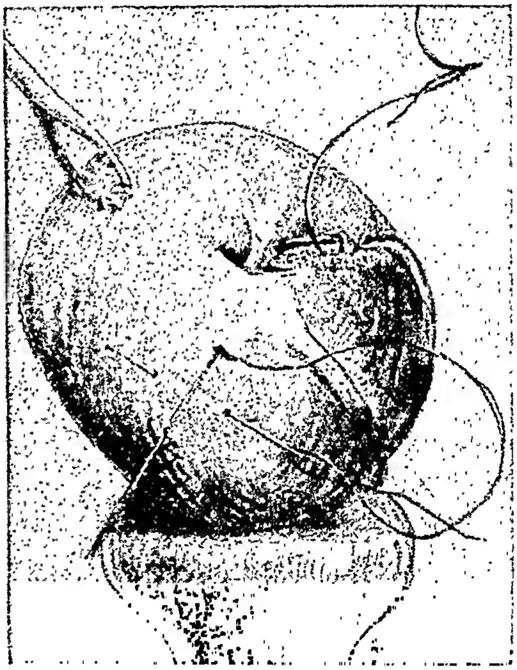

Fig. 9.—One strand of the double suture is cut and the needle which now carries the other strand is passed through the uterine surface at right angles to the direction of the double suture. The two ends of the double suture are now tied, thus anchoring the end of the tube in the pocket.

The cut end of the distal portion of the tube may be buried in the mesosalpinx with a running suture or it may be left unburied if this part of the operation presents any difficulty.

abdominal, although this should not be a valid objection to a competent operator if thereby the patient's comfort is increased.

The essentials for the operation are:

1. The patient should be a multipara in whom the pelvic supports are well relaxed.

2. The uterus should be freely movable and easily drawn down. A previous suspension or fixation or the presence of adhesions limiting the mobility of the uterus are contraindications.

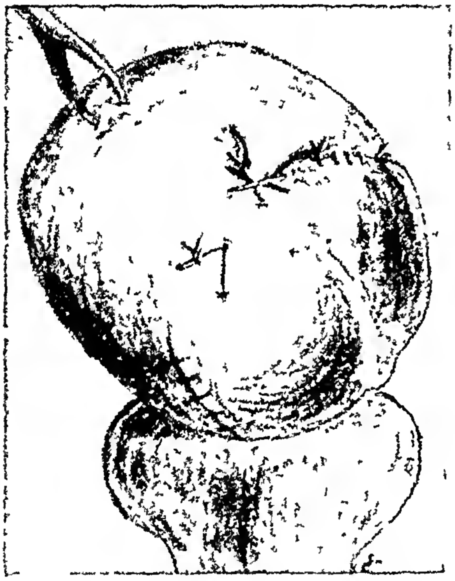

Fig. 10.—The mouth of the pocket is closed with a figure-of-eight suture. The other cornu is drawn into view and the same procedure repeated on the other tube.

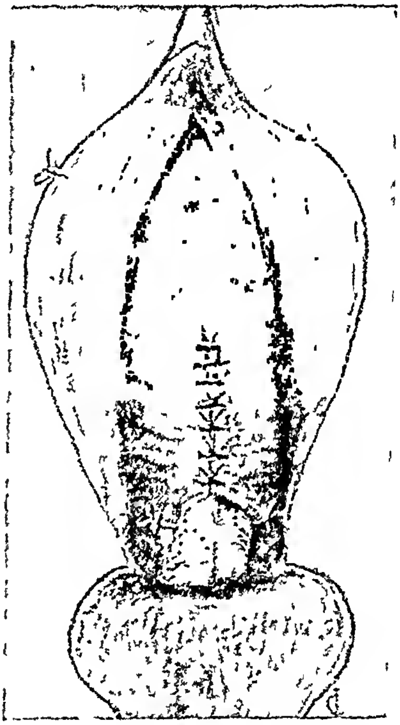

Fig. 11.—The portion of the uterus that has been delivered is returned to the peritoneal cavity. The incision in the uterovesical fold is not sutured as its closure is likely to prevent the escape of blood from the sites of operation on the uterus. A drain is placed to the uterus through the peritoneal opening to prevent the formation of a hematoma and is removed at the end of forty-eight hours if conditions are satisfactory. A cigarette wick is more easily removed than one of gauze alone. The vaginal incisions are closed to the drain with interrupted sutures.

3. If the patient is pregnant she should not have passed the fourth month of gestation. I have emptied by classical anterior vaginal hysterotomy the uterus of a woman who was five months pregnant and sterilized her with considerable difficulty *per vaginam*. In my opinion patients who have passed the fourth month are best operated on abdominally.

In all four cases sterilization was effected by doubly ligating the tubes and burying their proximal ends in the uterine musculature according to the method I devised and now employed in the Boston Lying-in Hospital for abdominal sterilization. One patient was assumed not to be pregnant, but her uterus was curetted as a precautionary measure and she was sterilized by vagina. Another was five months pregnant. Her uterus was emptied by vaginal cesarean section as noted above and sterilization done by vagina. The other two were two and three months pregnant. Their uteri were partially delivered after section of the uterovesical fold of peritoneum and were emptied by longitudinal incision of the anterior surface above the cervix as advocated by Kakuschkin.

The indication for operation in all four cases was chronic nephritis.

One operation was done under gas-oxygen-ether; the other three under a combination of pantopon-scopolamine and sacral anesthesia with gas-oxygen when needed. The convalescences of all were normal and notably comfortable and the patients were allowed up on the tenth day.

The legends accompanying the illustrations give the steps of the operation in detail.

475 Commonwealth Avenue.

CARCINOMA OF THE CERVIX IN A THIRTEEN-YEAR-OLD PATIENT

By Adolph Bonner, M.D., Brooklyn, N. Y.
(Attending Gynecologist, Jewish Hospital)

Carcinoma of the cervix in women under twenty years of age is extremely rare. Practically all such cases reported in the literature were diagnosed when the disease was well advanced. In the writer's opinion, the term "cancer age" and all that it conveys to the medical mind, is of inestimable value, if not interpreted too literally. The possibility of cervical carcinoma occurring in the first two decades of life should be borne in mind. The following case is reported because of the youth of the patient, there being only two authentic cases of cervical carcinoma reported in individuals younger than thirteen. Of secondary interest is the fact that the patient is a Jewess, it having been observed frequently in the literature that cervical carcinoma is relatively uncommon in Jewish women of all ages.

R. M., age 13, American Jewess, school girl. Her family history was irrelevant. She had measles and diphtheria in childhood. A tonsillectomy was performed at the age of six. In April, 1921, when nine years old, she was treated in the out-patient department of a New York hospital for "itching in the rectum," and difficulty in starting the urinary flow. The diagnosis of "vulvitis traumatic" was made and the last progress note reported her condition improved. No history of trauma was obtainable. The patient states, however, that she has had more or less indefinite symptoms of rectal itching and bladder disturbances for several years.

Her first menstruation occurred in August, 1923, at the age of eleven; was scanty and of one day's duration. Her next period was two months later, moderate flow, lasting eight days. Thereafter the periods occurred every ten to fourteen days, moderate in amount and associated with mild cramp-like pains in the left lower quadrant, these pains occurring on the second day of menstruation and lasting for a few hours. About November, 1924, a thick cream-colored foul vaginal discharge appeared, of sufficient profusion to necessitate the constant wearing of a napkin. This leucorrhea continued up to the time the patient presented herself at my office. In January, 1925, she had a profuse vaginal hemorrhage causing her to faint. The vaginal bleeding continued for two weeks, during which time the patient was in bed. After an interval of three weeks, a repetition of the profuse bleeding occurred and lasted for two and one-half weeks. This sequence of events was repeated, the "hemorrhages" ceasing spontaneously on each occasion. About March, 1925, she was given two deep roentgen exposures, with an interval of nine days, the exposures being directed over her spleen and flat bones. This did not influence the course of the bleeding. Shortly after this, in April, 1925, she was admitted to a hospital where she was given two blood transfusions of 250 c.c. each, and was discharged twelve days after admission with the diagnosis "ovarian dyscrasia." Her hemoglobin, at this institution, was recorded as 50 per cent on admission, and 75 per cent following her second transfusion. A vaginal examination was not made.

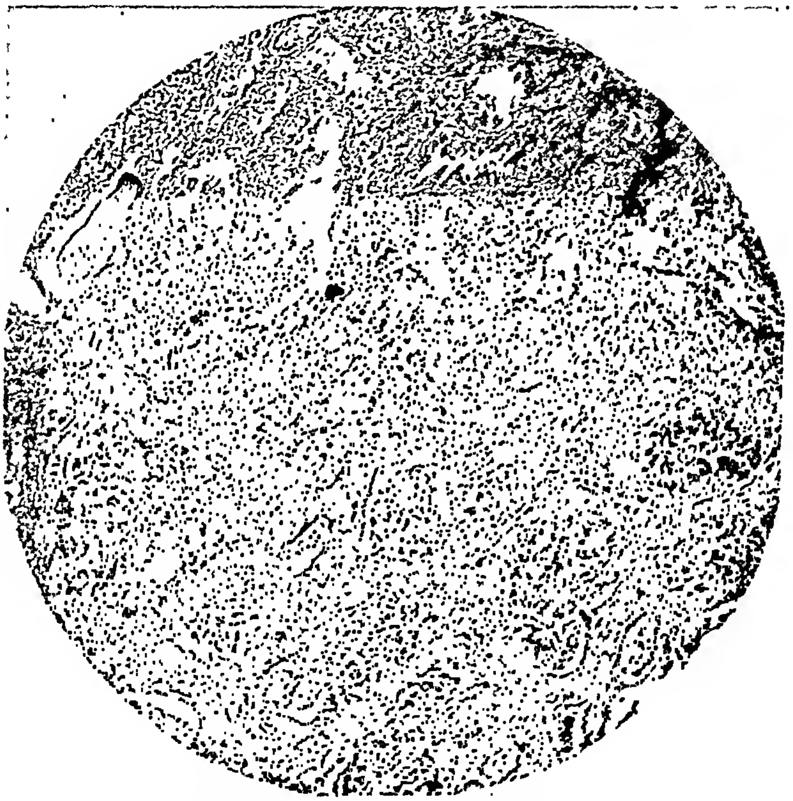

Fig. 1.—Low power. Showing atypical gland structures and irregular distribution of cells in the cervical musculature. (x 60.)

The patient was admitted to the Jewish Hospital on June 9, 1925, about one month after her discharge from the other institution, her bleeding having continued unchecked. Bleeding was the chief complaint on admission.

Physical examination showed a well nourished, well developed girl, obviously anemic. She was mentally bright. Her general physical examination was essentially negative. Rectally, the cervix was definitely enlarged. The hymen was intact, but permitted introduction of the examining finger. A soft rounded mass was felt in place of the cervix, the size of a small orange, and occupying the entire vaginal vault. Inspection of this mass through a virgin speculum, showed a cauliflower type of growth, entirely replacing the cervix, pale in color, and giving the impression of a degenerating polyp. At one point there was an ulcerated area one centimeter in diameter. The growth was free of the vaginal wall, and the examining finger could be passed freely around it. The vaginal wall at the vault was slightly indurated, and yellowish gray in color. The uterus was not definitely outlined. No masses were felt abdominally.

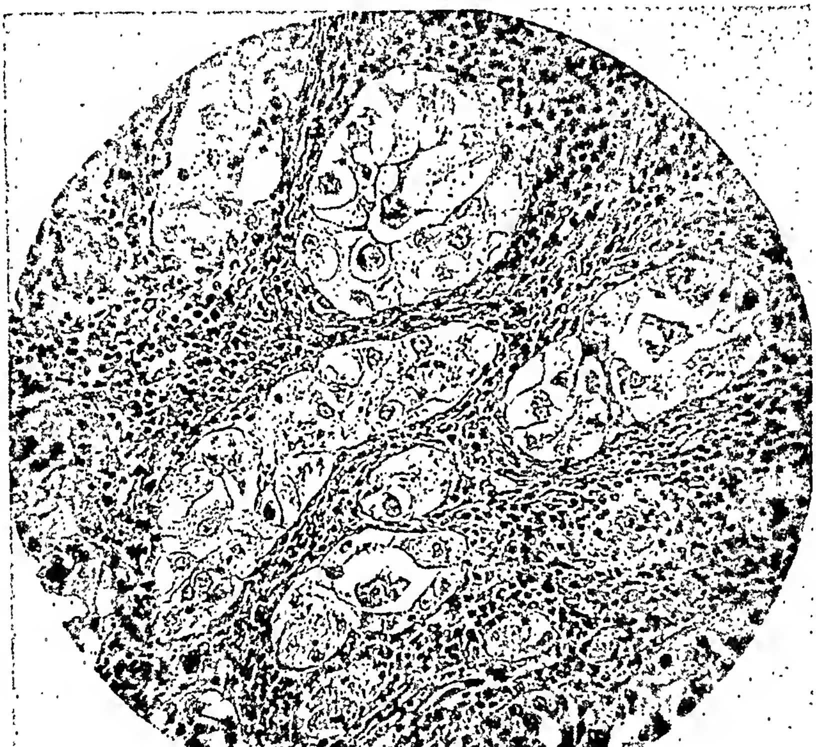

Fig 2.—High power. Showing the irregular cuboidal and polygonal cell outlines, granular cytoplasm and eccentric nuclei in various phases of mitotic activity. Many plasma and round cells are seen in the stroma. (x 350.)

Blood pressure 108/60. Blood Wassermann negative. Urine negative. Hemoglobin 42 per cent (Dare). RBC 2600000. WBC 9600 with 72 per cent polymorphonuclears. Bleeding time two and one-half minutes. Coagulation time seven minutes. X-ray examinations of the bones and lungs were negative.

She was given a transfusion of 300 c.c. of whole blood before going to the operating room, June 17, 1925. Under gas and oxygen anesthesia, a cautery excision of the growth was performed, the entire infravaginal cervix being removed; 25 millicuries of Radon (radium emanations), were inserted into the uterine cavity, and 5 Radon "seeds," one-half millicurie each, were buried at equidistant points in the cervical stump. The 25 millicurie Radon capsule was removed at the end of forty-five hours.

The patient made an uneventful convalescence and was discharged in ten days. At this writing it is nineteen months since her operation and two years since the onset of her symptoms. The cervical stump is well healed, freely movable and no masses are felt. The patient has gained in weight and her metrorrhagia as well as her menstrual function has not reappeared. Following her operation Dr. Milton Wasch has continued to give her x-ray therapy.

Pathologic Report by Dr. Lederer: Specimen consists of a portion of the cervix and several pieces of tissue. Gross: Several small pieces of tissue measuring 1 to 2 cm. in size, present a similar appearance. The consistency is soft and very friable, and they are of a grayish-red color, being apparently papillomatous masses. *Microscopic:* Under low magnification (Fig. 1), the mass is seen to be composed of an abundant stroma in which there are scattered numerous gland-like structures.

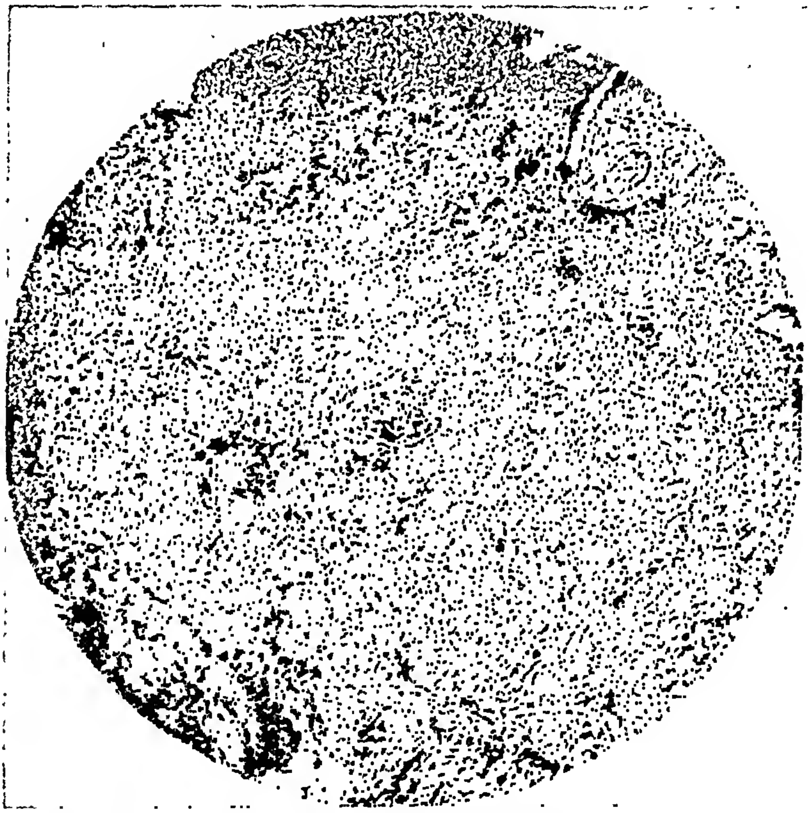

Fig. 3.—Low power. Showing area of cervix nearer to fundus less extensively involved. In the lymphatic spaces are seen islands of epithelial cells similar to those in Figs. 1 and 2 but more compactly arranged. (x 60.)

In some places the stroma is relatively less, due to the presence of a diffuse distribution of cells, similar to those which make up the tubules. Under high magnification (Fig. 2), the cells composing the tubular structures are cuboidal and polygonal in shape. They vary in size considerably. The protoplasm is granular and the nucleus occupies an eccentric position. Many evidences, including mitosis, of active cell proliferation are present. The appearance of these cells and their arrangement stamps them as being unquestionably epithelial in type. The stroma is composed of a compact fibrous tissue which contains a very large number of plasma and round cells, (Fig. 2). *Cervix, Gross:* Cervical tissue, firm in consistency, pinkish in color, presents a lobulated appearance. *Microscopic:* (Fig. 3), Normal except for the presence in the lymphatics of numerous islands of tissue similar to those described above. The arrangement, however, is more compact, and is probably due to the histologic structure of the cervical tissue. In some areas there is a pronounced plasma cell reaction.

Diagnosis: Papillary adenocarcinoma of tho cervix.

Because of the rarity of carcinoma of the cervix at this age, the sections were submitted to Doctors Elise S. L'Esperance and James Ewing, who corroborated the diagnosis of adenocarcinoma.

A careful search of the literature for cervical carcinoma in the young, revealed but two authentic cases reported in subjects younger than thirteen.

Ganghofer[10] in 1888, reported a case in a girl eight years old. Although the pathologic diagnosis has been questioned by later writers, it was probably a genuine case of carcinoma. The histologic diagnosis was corroborated by Professor Chiari of Prague.

Glöckner[14] in 1908, reported a case in a girl of seven, the diagnosis in this instance being confirmed by Robert Meyer and Carl Ruge. This was a case of adenocarcinoma.

Engelhorn[8] mentions Rosenstein's case in a child of two, and the report of this case bears the statement that the preparation of the specimen did not permit of a definite interpretation, but it was most probably a case of carcinosarcoma of the cervix. According to Engelhorn, Ganghofer's case is the youngest positive one proved by microscopic diagnosis. Engelhorn mentions Ripem, who reported a case of endothelioma of the cervix in a girl of thirteen from Halle's Frauenklinik, the youngest case of malignancy in his series. Fränkel's case of carcinoma of the cervix in a girl of nineteen, microscopically diagnosed by Eckhardt, and Schauta's case of malignant adenoma of the cervix in a girl of seventeen, are also cited by Engelhorn. Glatter's case aged seventeen and Beigel's case aged nineteen do not present enough evidence to both Engelhorn and Schauta, to be classified as true carcinoma cases.

Adams[1] in 1915, reported a case of glandular carcinoma of the uterus in a child aged two and one-half years. The pathologic committee of the Royal Society of Medicine, however, reporting on this specimen, called the growth a teratoma, not a carcinoma.

Cragin[5] and DeRouville[20] both reported cases of cervical carcinoma in eighteen-year-old patients. Cragin's case was confirmed microscopically by Francis Carter Wood. Peterson[18] mentions Wells' case of adenocarcinoma at the level of the internal os in a married woman of eighteen. Peterson also cites his own case of carcinoma of the cervix in a married woman of twenty-one and six others between twenty and twenty-five years of age in a series of five hundred cases of uterine carcinoma.

Eckhardt[7] in 1887, reported a case of cervix carcinoma in a nineteen-year-old woman.

Tschopp[21] in 1897, reported a case of body carcinoma in a patient nineteen years old.

Gayraud[11] up to 1911, had found three cases of uterine carcinoma in the first twenty years of life, those of Eckhardt, Tschopp, and Ganghofer, which are cited above. Of these, Peterson says, "It is questionable if these cases are not in reality teratoma or sarcoma, not carcinoma."

Webster[22] gives Gusserow's statistics. In 3471 cases, the latter found two cases below the age of twenty, one at seventeen, the other at nineteen. He had 114 cases between the ages of twenty and thirty.

Koblanck[16] in a larger series numbering 6354 cases, found only the two cases mentioned by Gusserow below the age of twenty.

Little[17] in 1896, reported a case of carcinoma of the cervix in a girl of fourteen. No histologic examination of the specimen was made here.

Darnall[6] in 1920, reported a case of adenocarcinoma of the cervix in an unmarried colored girl of twenty who gave no history of any pregnancy or miscarriage.

Gibson[13] in 1920, reported six cases in women between twenty-five and twenty-nine years of age, five of whom were married.

Bland-Sutton[3] has seen cases in women of twenty-three, twenty-five and twenty-six.

Bland[2] has had two cases at twenty-three, and several between twenty-four and twenty-seven years of age.

Forsdike[9] in 1921, reported a case of adenocarcinoma of the cervix in a virgin aged twenty-four.

Gérin-Lajoie[12] in 1923, reported a case of epithelioma of the cervix in a nullipara of twenty-three. This patient also had a two-plus Wassermann.

Hammond[15] states that 3 to 4 per cent of cases of carcinoma of the uterus occur in nulliparous women. In 1922, he reported nine cases in nulliparous women, ages ranging from twenty-nine to sixty, three being single. Weir in 1900 reported a case of adenocarcinoma of the cervix in a nullipara aged twenty-eight and McKendrick in 1907 reported a case of epithelioma of the cervix in a single woman aged fifty-seven.

Brown[4] in 1920, reported a case of squamous-cell carcinoma in a primipara aged twenty-four, developed during pregnancy, and who was delivered of a healthy child.

SUMMARY

1. A case of undoubted adenocarcinoma of the cervix in a thirteen-year-old girl is the third case below the age of fourteen recorded in the available literature.

2. Carcinoma of the cervix below the age of twenty is extremely rare.

3. Cervical carcinoma is not rare between twenty and thirty and the danger of employing the expression "cancer age" literally is obvious.

4. There are many cases of carcinoma of the cervix reported in nulliparous women.

REFERENCES

(1) *Adams, J. E.:* Proc. Roy. Soc. of Med., 1915-16, ix, 2. (2) *Bland, P. B.:* Gynecology—Medical and Surgical, Philadelphia, 1924. (3) *Bland-Sutton:* Tumors, Innocent and Malignant, New York, 1917, Paul Hoeber. (4) *Brown, W.:* Tr. Am. Assn. Obst. Gynec., 1920, 1921, xxxiii, 51. (5) *Cragin, E. B.:* Am. Jour. Obst., 1913, lxvii, 144. (6) *Darnall, W. E.:* Penn. Med. Jour., 1920-1921, xxiv, 250. (7) *Eckhardt, C. TH.:* Arch. f. Gynäk., 1887, xxx, 471-478. (8) *Engelhorn, E.:* Beitr. z. Geburtsh. u. Gynäk., 1908-1909, 13. (9) *Forsdike, S.:* Soc. Med. Lond., 1921-1922, xv, Sec. Obst., Gyn., 13. (10) *Ganghofer, F.:* Ztschr. f. Heilkunde, 1888, ix, 337. (11) *Gayraud:* Carcinoma in the First Twenty Years of Life, Thèse de doct., Montpelier, 1911. (12) *Gerin-Lajoie:* Bull. et Mem. de la Soc. Anat. de Paris, 1923. (13) *Gibson, G.:* AM. JOUR. OBST. AND GYNEC., 1920, i, 273-275. (14) *Glöckner:* Zeitschr. f. Geburtsh. u. Gynäk., 1908, lxiii, 182. (15) *Hammond, F. C.:* Phil. N. Y. Med. Jour., etc., 1922, cxvi. (16) Koblanck: Handb. d. Gynäk., 1908, p. 649. (17) *Little, W. L.:* New Orleans Med. and Surg. Jour., 1896-7, xlix, 322. (18) *Peterson, R.:* Surg. Gynec. Obst., 1919, xxix. (19) *Rosenstein:* Virchow's Arch., xlii (mentioned by Engelhorn). (20) *DeRouville:* Bull. Soc. d'obst. et Gyn. de Paris, 1912, i, 388-390. (21) *Tschopp:* Zentralblatt f. Gynäk., 1897. (22) *Webster, J. C.:* A Textbook of Diseases of Women, 1907, Philadelphia, W. B. Saunders Company.

435 GRAND AVENUE.

THE COMMON CAUSES AND THE PREVENTION OF REACTIONS FOLLOWING INTRAVENOUS INJECTIONS OF GLUCOSE (DEXTROSE) SOLUTION*

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IN OBSTETRICS as well as in medicine and surgery the intravenous administration of glucose solution has now attained considerable importance as a rational therapeutic measure for a number of conditions. For this reason a discussion of the reactions which occasionally follow such injections should be of general rather than merely obstetric interest even though it is in the latter field that this treatment is most frequently employed.

The usefulness of such injections in various acute intoxications is now well established. Litchfield[1] was one of the first to advocate this procedure in certain medical conditions, notably pneumonia, and it was this suggestion of his which led one of us (Titus) to utilize and develop this method of treatment for pernicious vomiting and other toxemias of pregnancy. These results have been published from time to time[2] and do not enter into this discussion more than to introduce the comment that others have successfully followed the treatment until the value of the general principles involved has become an accepted fact.

The application of this treatment to general surgery has developed apace, and now there is nothing which relieves postoperative vomiting and acidosis as quickly and effectively as a few intravenous injections of glucose solution. Polak[3] recommends it as a prophylactic measure before beginning cesarean section; it is particularly valuable as a preliminary to prostatectomy and cholecystectomy; and we have now come to the point of giving routinely an intravenous injection of glucose solution immediately after every major obstetric or gynecologic operation as a preventive of shock and distension, nausea and acidosis. It is also especially useful supportive treatment in the vomiting and dehydration of peritonitis.

Much as the treatment is used, physicians would probably utilize it far more frequently if it were not for the reactions which occasionally follow such injections. These reactions manifest themselves by a sharp chill, usually considerable rise in temperature with shock and collapse which may be mild or may be serious. Exceptionally a death has been reported.

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*Read before the Pittsburgh Academy of Medicine, March 31st, 1926.

During the several years that first one and then both of us were developing and using this treatment for pregnancy toxemias there has been the opportunity to give or supervise an untold number, running into many hundreds, of such injections. Without hesitation the bald statement may be made that reactions are almost invariably due to faulty technic either in the preparation of the glucose solution or the method of its administration. Consequently reactions should be largely preventable. The few that have been seen in our service were mild and probably all could have been avoided, despite the fact that it was necessary gradually to develop both the dosage and the technic of administration in pregnancy toxemias since this was work which had not been done before.

It soon appeared that there were a few definite rules to follow, and while these have been generalized in our previous works they may be outlined as follows:

1. *Dosage.*—The average dose for an adult is about one gram per kg. of body weight. An average adult weighs between 50 and 75 kg. so that it was decided to establish 75 gm. as the initial dose, subsequent doses to be 50 gm. There will be some spill through the kidneys, but the appearance of sugar in the urine following such an injection is of no especial significance. This loss is lessened the more slowly the injection is given. To give less than a therapeutic dose is a common mistake and accounts for some disappointments with the treatment.

2. *Glucose (Dextrose).*—The glucose should be chemically pure. In our service this has been insisted upon from the time of the first publication in 1920. Several different preparations have been used and while there is little choice if chemically pure we have usually used Merck's c.p. anhydrous glucose. This firm markets also a grade of glucose for which no claim of chemical purity is made, but which is issued in the same type of bottle with a label similar to the "c.p." grade, bearing the words "Pure Glucose." Because of the resemblance of the two products the one may easily be confused for the other, but only the chemically pure should be used for intravenous administration. This similarity in the packages is unfortunate.

3. *Solvent.*—The glucose should be dissolved in *freshly* double distilled, uncontaminated water, and not in salt solution or sodium bicarbonate solution as has been variously recommended. In the preparation of a single dose, 50 gm. of the glucose is carefully weighed and then dissolved in 200 c.c. of freshly distilled water, using only glassware which has been thoroughly washed in distilled water. Before preparing for sterilization the solution should be filtered at least five or six times to remove even tiny particles of dust or cotton fibers. For the sake of simplicity in making any necessary calculations for dilutions it is convenient to have each flask contain 25 gm. of glucose in 100 c.c. of water (25 per cent), or a "half dose."

The recent work of Seibert[4] followed by that of Bourne and Seibert[5] has developed the interesting fact that the cause of many febrile reactions following intravenous injections of various solutions is to be found in bacterial contamination of distilled water. The "pyrogen" is apparently a nitrogenous product of the contaminating bacteria, and even though the latter are destroyed by sterilization of the water or the solution made from this water, the "pyrogen" is unaffected and will cause sharp reactions in a large percentage of instances. Their study of this subject has been rounded out by a series of experimental reactions on laboratory animals, and it is probable that their investigations will account for the majority of hitherto unexplained reactions following the intravenous injection of different solutions.

It is essential, therefore, that freshly double-distilled water be used as the solvent of laboratory-made glucose preparations, and as the diluent of the more concentrated solutions now to be purchased in ampoules. Dependence upon the local ice-plant for distilled water of uncertain age and bottling is obviously unsafe.

4. *Concentration of Solution.*—We desire to emphasize that, in our opinion, a 25 per cent solution (50 gm. in 200 c.c. of water) is the generally desirable strength. When this work was begun several years ago a 6 per cent solution was the first used, but the concentration has been gradually advanced up to this point as the direct result of the observation that the stronger the solution the more rapid and lasting are the effects. Moreover, some extremely unpleasant consequences have followed in some instances, notably in pneumonias, when the vascular system has been rapidly overloaded by a large volume of weak glucose solution. It is apparent that if the solution is weak a large amount must be given in order to carry a therapeutic dose of the glucose.

It is, we believe, a distinct advantage to use a strongly hypertonic solution because its hypertonicity actually favors a more rapid interchange between the tissues and the bloodstream, so that toxins are diluted, edema lessened, and the sugar seized and stored more rapidly by the tissues.

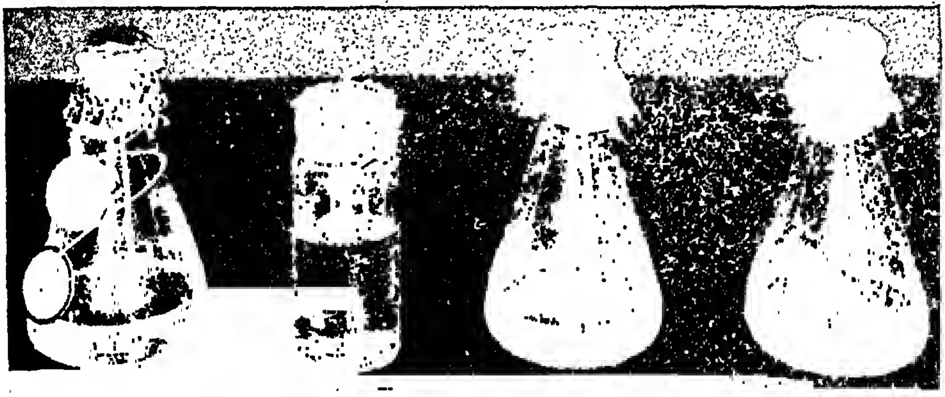

Fig. 1.—Typical flasks of glucose solutions. No. 1. Properly prepared and labeled flask of glucose solution. Note clarity, the lead-foil seal, and the space in flask above surface of solution which avoids wetting stopper by vacuum pressure in sterilizer or by splashing. Suitable for intravenous use.

No. 2. Properly prepared, clear solution but in wrong type of container. Note that stopper has become wet during sterilization of glucose solution and sugar has crystallized on foil seal. Unsuitable for intravenous use.

No. 3. Unfiltered solution. Cloudiness persists after sterilization. Unfit for intravenous use.

No. 4. Contaminated solution with growth of mould. Unfit for intravenous use.

If more fluids are required it is safer to consider this as an entirely separate matter and administer them as submammary infusions of salt or weak glucose solution.

A 10 per cent solution of glucose should be considered, therefore, as about the lower limit of safety in dilution and a 25 per cent solution be preferred unless there is some definite indication for the immediate and rapid administration of additional fluid by the blood-stream route. It is quite likely that certain reactions are attributable to the injection of an excess of distilled water when weaker solutions are used.

5. *Sterilization.*—The flasks of glucose solution after being properly stoppered with cotton plugs in gauze and the top sealed with lead-foil, should be sterilized in a steam sterilizer for one-half hour at 100° C. on three successive days. It

may be prepared more quickly for emergencies by being sterilized in an autoclave at 15 pounds pressure for twenty minutes.

In either case sufficient space should be left between the level of the solution in the flask and the stopper so that the solution will not be forced by vacuum up against the stopper. This is also a precautionary measure against the possibility of splashing the solution against the stopper in any handling of the flasks.

Solutions showing caramelization or sediment after sterilization should be discarded.

6. *Age of Solution.*—Glucose solution kept in flasks stoppered with cotton, or cotton and gauze, and sealed with lead-foil will show comparatively little change in the hydrogen-ion content over a considerable period of time, even though buffer-salts have not been added, so that solutions may be prepared in advance of the need for them. One of the collaborators in an earlier one of these researches kept flasks of glucose solution on a laboratory shelf for six months with practically no change in acidity.[6]

As a matter of fact the greatest variation takes place during the course of the sterilization of the solution and from then on it remains fairly constant.

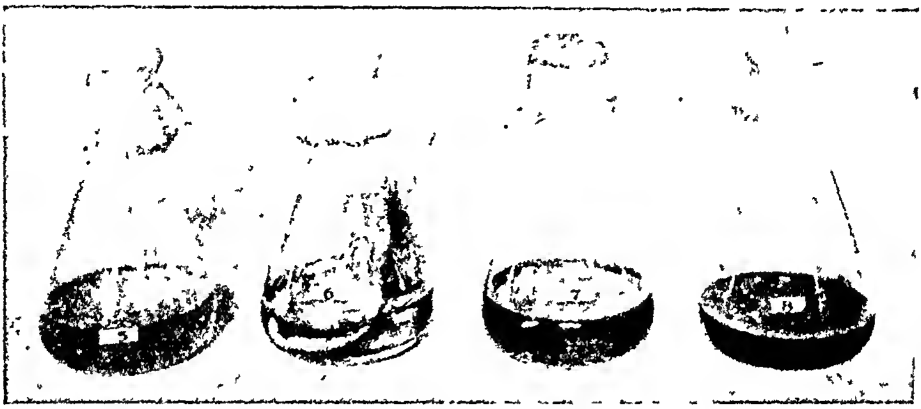

Fig. 2.—Typical flasks of glucose solutions.

No. 5. Solution made from a commercial corn-syrup. Light yellow color and impure. Unfit for intravenous use.

No. 6. Clear, thick commercial glucose. Unsuitable for use in solutions for intravenous injection because of impurity and stickiness. Note: flask was tipped to one side a moment before photographing. Viscosity is clearly shown in illustration.

No. 7. Solution partly caramelized from over-sterilization. Unfit for intravenous use.

No. 8. Thick caramelization from repeated sterilization. Unfit for intravenous use.

Solutions should preferably not be kept longer than four weeks unless hermetically sealed, and the fresher the solution the safer it probably is. It is seldom, however, that a reaction can be traced to a solution that is no more than from two to four weeks old.

7. *Ampoules of Glucose Solution.*—Ampoules of glucose (dextrose) solution are now on the market and apparently have been carefully and properly prepared by their manufacturers. Many of these have been used in our clinic with satisfactory results, and the only one open to particular comment is that of one firm to which cresol has been unnecessarily added as a preservative. This ampoule contains only 10 gm. of glucose so that if enough ampoules are used to obtain a therapeutic dose for anything other than insulin hypoglycemia, a reaction is a common aftermath on account of the total amount of cresol injected.

Hospitals which are using large amounts of glucose intravenously find it economical to prepare their own solutions, but for small services or emergency work these ampoules are very useful.

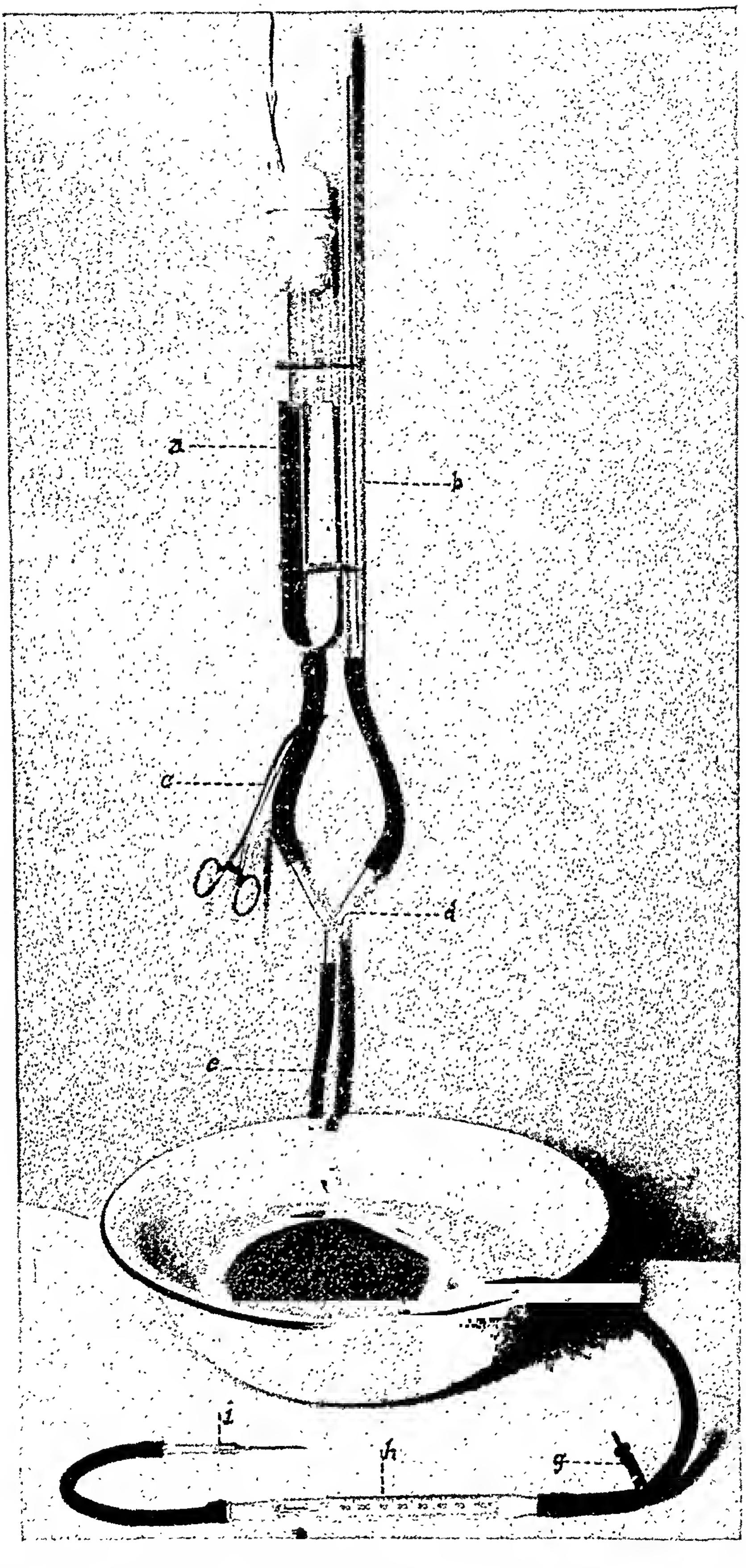

Fig. 3.—Infusion apparatus (Freidell-7): Arranged to control rate of flow and temperature of solution; as modified by Farrar at Woman's Hospital, New York.

(a) Infusion flask and (b) titrating burette held together by rubber bands. (c) Clamp shuts off flow from main flask while rate of flow is being determined from burette. (d) Glass Y-tube connects two flasks with (e) main rubber tubing coiled in (f) basin of hot water to maintain temperature of flowing solution. (g) Clamp regulates speed of flow and (h) infusion thermometer indicates temperature. (i) Adapter and intravenous needle.

For convenience and compactness they are usually prepared as 50 per cent solutions (25 gm. of glucose in 50 c.c. of water) with directions for diluting. If freshly distilled sterilized water cannot be obtained for this purpose, it is probably safer to inject the solution as it comes from the ampoule even though so highly concentrated.

8. *Technic of Administration.*—The injection should proceed slowly at the rate of 4 c.c. per minute for a 25 per cent solution, and during this period the solution should be kept hot. The solution is ordinarily injected from a salvarsan tube, using a small caliber needle, and having the tube coiled in a basin of hot water to keep the temperature of the flowing fluid up to from 100° to 110° F.

Fresh rubber tubing should not be used until after it has been thoroughly washed in running water, then boiled in clean water (without sodium carbonate), again washed, and finally sterilized in an autoclave.* Chemical contamination from new rubber tubing has been suggested as a cause of reactions following these injections.

The salvarsan tube and the connecting tubes, as well as the rubber tubing, should be thoroughly cleansed and then sterilized in an autoclave, because when merely boiled sediment from the water is often to be seen within the glass. Before beginning the injection the system should be rinsed out by running distilled water through the salvarsan tube, the rubber tubing, the connections, and the needle.

Briefly to recapitulate, therefore, it may be said that reactions following intravenous injections of glucose solution are usually the result of several general faults: (1) The use of impure glucose; (2) its being dissolved in something other than freshly distilled, uncontaminated water; (3) improper preparation and sterilization of the solution and the apparatus for its administration; (4) the administration of the glucose either too rapidly, too cool, or in too weak a solution.

To illustrate the foregoing several experiences of colleagues as well as personal observations should be appended:

Example I. A patient with pernicious vomiting of pregnancy was reported to have had a serious reaction with prolonged dyspnea and cyanosis following an intravenous injection of glucose. Investigation showed that the solution was prepared by a local druggist from a box labeled commercial glucose, that this was weighed on unwashed drug-store scales, dissolved in distilled water from an open bottle, and boiled for its sterilization. It was yellow and undoubtedly both impure and caramelized.

Example II. Following glucose injections several sharp reactions and one death (a prostatectomy case) occurred at a large hospital in this city. The solutions were usually prepared by the hospital biochemist and had never before given trouble. He was away on vacation, and investigation showed that the glucose used was chemically pure, but had been dissolved in 1 per cent salt solution. There was an odor of camphor which could not be explained, and the solution was not clear, containing tiny fragments of lint and other foreign material. It was given as a weak solution being either 5 or 10 per cent. The precise cause of the trouble could not be determined but was attributed to the combination of salt with the solution, and the failure to filter before sterilization. It is not unlikely that the distilled water used in making the salt solution may have been contaminated by bacteria in the laboratory before being sterilized.

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*Note: Several months after the presentation of this paper before the Pittsburgh Academy of Medicine there was brought to our attention the report of a similar investigation conducted at Sloane Hospital for Women, New York City. While this report has not been published their conclusions were similar in many respects to ours, and particular mention was made of the effect of new rubber tubing in the causation of reactions. It was recommended that new rubber tubing should be treated before using as follows: (1) Soak in soap and water one hour. (2) Wash well with soap and water. (3) Wash in running water. (4) Soak for six hours in 4 per cent solution of sodium hydroxide. (5) Wash well in running water. (6) Wash well in distilled water. This technic has now been adopted in our hospital.

Example III. Several reactions reported from another Pittsburgh hospital were found to be due, in spite of a clean clear-appearing fluid, to the fact that the glucose used in making this solution for intravenous injection was a thick syrup poured from a five-gallon tin can which was standing on the floor of the drug-room with a sticky, dirt-encrusted spout, and obviously a commercial and impure product. It had been injected both as a 5 and a 10 per cent solution so that at this dilution it was not too sticky to flow when hot, but at 25 and 50 per cent poured slowly and thickly.

Example IV. A colleague reported several deaths following intravenous injections at the Army base-hospital where he was stationed during the influenza epidemic. Twenty-five per cent solution was used and autopsy findings disclosed a thick, sticky substance clinging to the heart-valves. The assumption was that a 25 per cent solution is too concentrated to use, but as a matter of fact the liklihood is that the glucose supplied at the average Army base-hospital was the impure commercial glucose syrup in the tin-can container noted in Example III. It is noteworthy that the 50 per cent solution of pure glucose (dextrose) now obtainable in ampoules is not viscid and can be injected even at that concentration.

Example V. The charge-nurse of the operating room of a large hospital here showed a flask of glucose solution prepared for intravenous use. It was golden yellow, being about the color of thin maple-syrup, and she stated that this and the other flasks were regularly resterilized each Sunday morning! It should have been colorless, and repeated sterilization had probably not only caramelized it but also concentrated it until its percentage was an unknown factor.

Example VI. At another hospital the method of preparing glucose solution for intravenous injection was as follows: the druggist weighed out and made up packages of the required amount of chemically pure glucose. These were opened and emptied into a sterile flask when an injection was necessary. Sufficient sterile distilled water to make a solution of proper strength was poured over this and the whole injected. At no time was the sugar itself sterilized nor was the solution filtered.

Example VII. Mild reactions have occurred twice on our service when trial ampoules from two different manufacturers have been used on the same patient. The reaction came when the change was made from one preparation of glucose to the other.

Example VIII. A case illustrating the influence of too weak a solution as an occasional cause of reactions was seen in our own hospital. The interne on a surgical service was directed to administer intravenously a 10 per cent glucose solution to a patient with postoperative acidosis. The original glucose solution had been properly prepared; it was given slowly; and was kept at proper temperature. In regard to its strength, however, it was determined that the nurse had brought a flask containing 25 gm. of glucose in 100 c.c. of water, or a 25 per cent solution. A 10 per cent solution was called for, but in making the dilution the interne added 1000 c.c. of distilled water to the 100 c.c. of 25 per cent solution, considering the latter as though it were 100 per cent glucose without water so that the final mixture was merely distilled water gently sweetened.

To insure good results from intravenous administration of glucose solution, and to prevent unwarranted criticism of it as a therapeutic measure, it is advisable in home practice to use the proper ampoules of glucose (dextrose) now readily obtainable, or to have the solutions carefully prepared in a well-conducted laboratory. In hospital practice one person should be put in control of the entire work of the preparation of these solutions. The head nurse of the operating rooms is in charge of this work at our hospital and has specific instructions and directions regarding all details. She keeps the stock of chemically pure glucose, personally weighs or directs the weighing and filtration, as well as the bottling and sterilization, finally adding the label. This latter reads as follows: "Glucose—c. p.; 25 gm. in 100 c.c. freshly distilled water; sterilized on ________________ (date); for intravenous use until ________________ (date) only. Signed ____________________."

Intravenous injection of glucose solutions prepared and given under the conditions which have been outlined above will seldom, if ever, be followed by reactions.

The Head Nurse of the Obstetrical Department, Miss Nan Cooper, and the Head Nurse of the Operating Rooms, Mrs. Mary Zembower, as well as her predecessor, Miss Gertrude Beacock, have shown unflagging interest in this work. We are indebted to them for many practical suggestions which are included in this publication.

REFERENCES

(1) *Litchfield, Lawrence:* Jour. Am. Med. Assn.., Aug. 17, 1918, lxxi, 503. (2) *Titus, Paul, Hoffmann, G. L., and Givens, M. H.:* Jour. Am. Med. Assn., March 20, 1920, lxxiv, 777. *Titus, Paul, and Givens, M. H.:* Jour. Am. Med. Assn., Jan. 14, 1922, lxxviii, 92. *Titus, Paul:* Jour. Am. Med. Assn., Aug. 15, 1925, lxxxv, 488. *Titus, Paul:* West Va. Med. Jour., Dec., 1926, xxii, 617. (3) *Polak, J. O.:* Surg., Gynec. and Obst., April, 1926, xlii, 551. (4) *Seibert, Florence B.:* Am. Jour. Physiol., Feb., 1924, lxxi, 621. (5) *Bourne, Janet M., and Seibert, Florence B.:* Am. Jour. Physiol., Feb., 1924, lxxi, 652. (6) *Givens, M. H.:* Unpublished communication. (7) *Freidell, H. F.:* Jour. Am. Med. Assn., March 12, 1921, lxxvi, 724.

1015 Highland Building.

LIGATION OF THE UTERINE ARTERIES FOR CONTROL OF HEMORRHAGE IN PLACENTA PREVIA*

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THE ever-present high mortality to both mother and child in placenta previa is a source of great worry to obstetricians, and those who have had mishaps, will no doubt welcome a treatment which is reliable in the control of hemorrhage, especially the protracted bleeding following delivery of the child and placenta. The method occurred to me while handling a case of placenta previa centralis in March, 1925, at which time I was unfamiliar with the work of Harold Miller who had done the same operation in 1907 and reported eleven cases. The operation was apparently not generally adopted or fell into disuse as no further reports appear in the literature since that time.

The method deals with the ligation of the uterine arteries through the vagina. The technic is as follows:

A vaginal retractor placed anteriorly holds the bladder up, while a lateral retractor exposes the right lateral vaginal fornix; the cervix is grasped with tenacula and pulled downward, backward, and to the left; with a large curved needle threaded with plain catgut a ligature is thrown around the main trunk of the right uterine artery and tied. This can be accomplished by inserting the point of the needle in the upper part of the right vaginal vault just anterior to the midplane and carrying the needle inward and as high as possible so as to include all the lateral parametrium. The needle follows a course upward and inward toward the uterus and emerges through the vaginal wall about an inch posterior to its entrance. On the dial of the clock the entrance would correspond to ten and the exit to eight with nine representing the position of the uterine artery. The same procedure is carried out on the left side and when this ligature is tied all bleeding stops. No denudation of the vaginal wall is made and the operation can be completed in a few minutes. (Fig. 1.)

My first patient was in her fourth pregnancy which had been stormy owing to bleeding spells during the last two months caused by placenta previa centralis. Delivery of the child and placenta was followed by severe bleeding for which uterine packs and oxytoxics were used. The bleeding continued and a transfusion of 500 c.c. of blood was done. The uterus was repacked and more oxytoxics given but

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*Presented before the joint meeting of the St. Louis and the Chicago Gynecological Societies at Chicago, December, 1926.

bleeding continued. There was good tone in the uterus but in this patient as is so often the case the lower uterine segment and the cervix continued bleeding and the patient rapidly became exanguinated. Manual compression and two more transfusions failed and the patient became pulseless. Ligation of both uterine arteries was done and another transfusion given. The bleeding stopped and did not recur. Both mother and child are living and another child has been born recently with no complications.

In a second case the ligation was done, as a prophylactic measure, after delivery. A third patient seen in consultation was practically pulseless from hemorrhage which was not under control. Ligation stopped the bleeding, transfusion was done, and the patient survived. It is my opinion that in the first and third cases the patients were saved from death by the operation. No unusual changes occurred in the uterus because of the ligation and the puerperium was normal. The lochia became serosanguinous on the second or third days. The method can be used prophylactically before delivery in placenta previa but would be somewhat difficult of execution if the head were low down and fixed, which it rarely is in placenta previa.

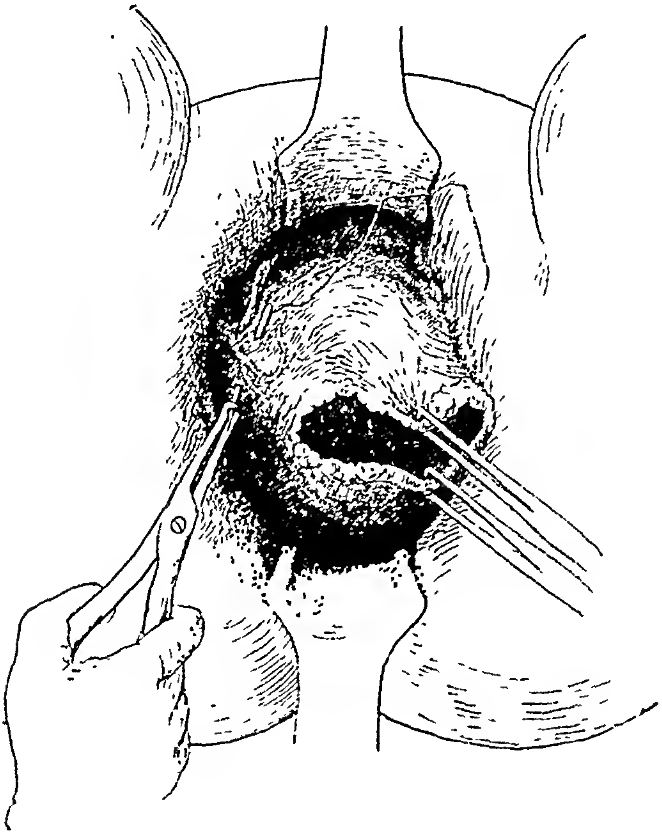

Fig. 1.—Method of ligating the uterine artery.

Two questions to answer are: (1) Is the ureter in danger of injury? (2) Is it possible to ligate the artery without first exposing it?

The answers will be found in Fig. 2, which is a drawing of a specimen removed after doing the operation on a fresh postpartum cadaver. It will be seen that the ureter is about one inch from the ligature which completely compresses the main trunk of the uterine artery. The safety of the ureter is assured by upward retraction of the bladder and downward pull on the cervix which tend to establish a "safety zone" which is about one inch wide. The only requisites for doing the operation are the few instruments carried in the regular obstetric kit and a knowledge of the relative anatomy. It is presupposed that good obstetric judgment is used.

Henkle has advised the use of clamps for the purpose, but the type of clamp used to compress the parametrium is not at one's disposal when needed and is more injurious to the tissues than a simple ligature. Should one include the ureter with a ligature of plain catgut no great harm would come, for the ligature would either be free in a few days or could be removed. The ligatures were not removed in my cases.

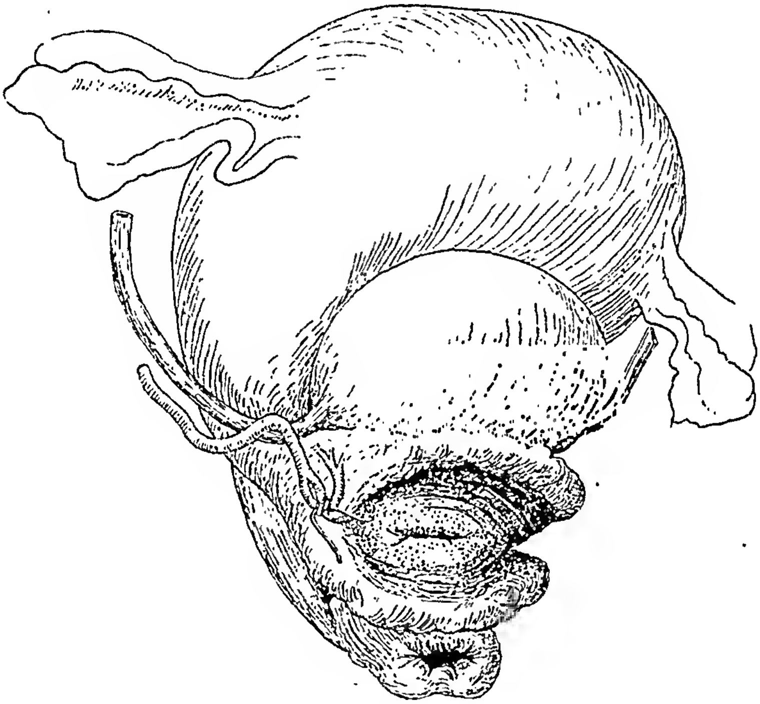

Fig. 2.—Cadaver specimen with uterine artery tied.

The operation should materially lessen the necessity for doing cesarean section in placenta previa and save many women who were heretofore doomed to death by hemorrhage.

SUMMARY

1. Ligation of the uterine arteries in placenta previa completely controls hemorrhage.

2. The method is simple and can be done in a few minutes by any qualified obstetrician either in a hospital or at home.
3. Cesarean section may not be necessary in the treatment of placenta previa.
4. Hysterectomy for bleeding after delivery is unnecessary.
5. Maternal mortality from hemorrhage should be greatly lessened.

REFERENCES

(1) *Miller, Harold:* Am. Jour. Surg., 1909, xxiii, 12. (2) *Henkel, Max:* Deutsch. med. Wchnschr., 1925, xxviii, 1139.

LISTER BUILDING.

THE SIGNIFICANCE OF INFLAMMATION OF THE UMBILICAL CORD*

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INFLAMMATORY changes of the umbilical cord have long been considered of more or less value in the diagnosis of fetal syphilis. Most importance has been ascribed to leucocytic and small round-cell infiltration of the vessel walls and adjacent connective tissue. Certain authors have also emphasized other changes such as thickening of the intima, with secondary vascular stenosis, edema with dissociation and even degeneration of muscle and elastic fibers, calcification, and gumma-like areas. Macroscopic findings have been considered of little value.

Bondi found changes in fifteen cords from thirty-one definitely and four probably syphilitic children. No cord from one hundred nonsyphilitic children showed inflammation, although there occurred such maternal complications as pneumonia, typhus fever, rheumatism, intrapartum and postpartum infection, and nephritis. He believed that positive findings were pathognomonic of syphilis but that negative findings were without significance. Seitz found the condition in syphilis only and believed it to be strong evidence of that disease. Ziegler was of the same opinion. Chiarabba saw inflammation in four instances of syphilis and believed gumma of the vein wall to be a specific lesion. Gargano mentioned small round-cell infiltration but stressed thickening and then destruction of the intima, dissociation of muscle fibers in the media, etc., as being the important syphilitic changes in the umbilical cord. Dominici found spirochetes where there were no gummata and believed that they could lead to the ordinary type of inflammatory exudate. Mohn found the changes in sixteen of twenty-four cords from syphilitic children. He believed that positive findings indicated a high probability of syphilis but were not absolutely characteristic. Thomsen, though finding one instance of inflammation in fifty-nine probably nonsyphilitic umbilical cords, concluded later from studies done with Boas that for practical purposes inflammation was diagnostic of syphilis.

Livon thought that the changes in the umbilical cord were not specific for syphilis but should be considered as evidence along with the other findings. Williams has stated that, although inflammatory cord changes are particularly common in syphilis, they are also found in other conditions. Rietz saw inflammation of the cord in three cases without any evidence of syphilis. Simmonds carefully studied four hundred umbilical cords, the fetuses being from ten centimeters in length to term size. Twenty cords from forty syphilitic cases showed inflammation. Among the three hundred and sixty nonsyphilitic cases, however, there were also thirty-two, or 9 per cent, with identical inflammatory changes. As a consequence, he believed that inflammation of the cord was of no diagnostic value.

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*Read before the Detroit Obstetrical and Gynecological Society, February 7, 1927.

Because of this divergence of opinion, a study was made of the umbilical cords in one thousand consecutive deliveries between seven lunar months and term. It was felt that the incidence of syphilis was determined with reasonable accuracy as follows:

Each mother during pregnancy, or shortly before in a few instances, received a careful examination, including a history and blood Wassermann tests with plain antigen and at least one of the more delicate antigens, such as Kolmer's or the cholesterinized. In questionable cases, the fathers were given the same examinations. A large majority of the children who were stillborn or died in the hospital were subjected to postmortem examination. Where autopsy was refused, roentgenograms were made of the long bones, as was also the case with the majority of the premature babies and all of those born of syphilitic parents. In addition, three-fourths of the living children were under observation for periods varying from six weeks to two years. As a further check, all placentas were examined for syphilitic changes.

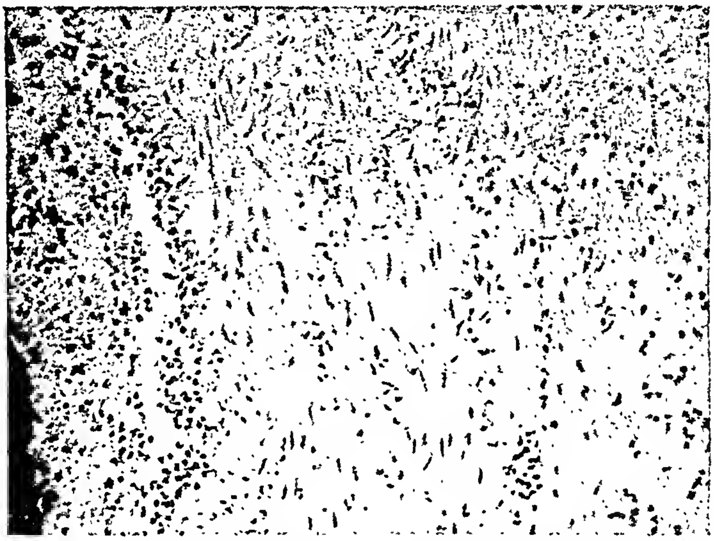

Fig. 1.—Moderate nonsyphilitic inflammation of an umbilical cord vein. The reaction extends into Wharton's jelly as shown above.

The placentas were inspected and weighed and, with the cords still attached, were hardened in formalin for three to eight weeks. Then, at least one section from each placenta and one from the placental end of the cord were examined microscopically. In four hundred and fifty instances a section was also examined from the fetal end of the cord.

Although no placenta showed Fränkel's syphilitic changes, and though clinical and serologic syphilis occurred in only sixteen instances, definite inflammation of the umbilical cord was found sixty times, an incidence of 6 per cent. It is noteworthy that among the known syphilitic cases inflammation occurred only once. Perhaps this comparatively low incidence with syphilis may be explained by the fact that intensive antisyphilitic treatment had been given during pregnancy in all but one patient with clinical lues. Because of its high incidence, however, (6 per cent) among the nine hundred and eighty-four nonsyphilitic cases, it would seem that inflammation of the umbilical cord in itself should be considered very unreliable as a sign of fetal syphilis.

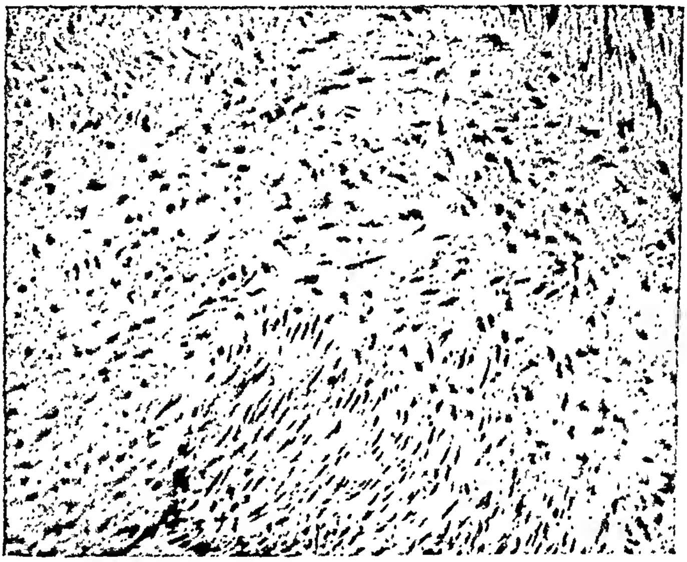

Fig. 2.—Slight inflammatory reaction in the wall of an artery from the same umbilical cord as the vein shown in Fig. 1.

A study of the relationship of the inflammatory process to the extremities of the umbilical cords was of interest since in Bondi's material it was more intense at the fetal ends, while Thomsen, Dominici, and Simmonds found more reaction in the placental portions. Among our four hundred and fifty cords, of which both ends were examined, there were thirty-seven with inflammation. Fifteen had an equal degree of reaction at both ends, nine more at the fetal end and thirteen more near the placenta. In confirmation of Mohn and Livon, the changes were never present in the arteries only but were usually more intense and occasionally present alone in the vein.

With syphilis thus eliminated as a factor, some other cause for inflammation of the umbilical cord was sought. Simmonds found the majority of the cord changes which were not accompanied by syphilis to be associated with the stillborn and premature children but determined no relationship to bacterial infection. Table I indicates an increased incidence among the stillborn and premature children in the present series. Furthermore, in the majority of cases there were certain associated conditions which are generally considered to be cause for, or evidence of, bacterial infection. Premature rupture of the membranes at or before the onset of labor occurred thirty-three times in the sixty cases; intrapartum temperature elevation to at least 100° F. was present eight times; and leucocytic inflammatory infiltration of the placental amnion and chorion was observed thirty-nine times. At least one of these conditions occurred in fifty of the sixty cases (83.3 per cent). The incidence was even greater with the fourteen cases of inflammation of the cord associated with stillborn and premature babies, since premature rupture of the membranes, intrapartum infection, and inflammation of the amnion and chorion occurred twelve, seven, and ten times respectively. At least one of the three was present in all but one case.

TABLE I. ASSOCIATION OF INFLAMMATION OF THE UMBILICAL CORD WITH STILLBORN AND PREMATURE CHILDREN

NUMBER OF BABIES		INFLAMMATION OF CORD NUMBER	PERCENTAGE
Normal Term	937	46	4.9
Stillborn	27	5	18.5
Premature (Under 2500 gm.)	36	9	25.0
Total	1000	60	6.0

The significance of inflammation of the umbilical cord in regard to the child is of interest. Although five of the sixty children associated with inflammation of the cord were stillborn for various reasons, the immediate prognosis for those born alive (in agreement with Simmonds) was not affected by its presence; for, of this number (fifty-five) only three, all premature, died during the first six weeks of life. The child of the untreated syphilitic mother was the only one to develop signs of syphilis. It showed definite x-ray evidence of the disease, but for more than two years has done well under treatment.

SUMMARY

Inflammation of the umbilical cord occurred frequently even where syphilis was satisfactorily ruled out and is, therefore, of no value in the diagnosis of fetal syphilis. It did not occur with treated syphilis. Both ends of the cord were usually affected, but the intensity of the changes had a tendency to be greater at the placental end and in the vein. In the majority of instances there was evidence which pointed to bacterial infection. The prognosis for the child was not affected by the presence of inflammation of the umbilical cord.

In conclusion I wish to thank Dr. F. W. Hartman for his kind assistance and advice.

REFERENCES

(1) *Bondi, J.:* Arch. f. Gynäk., Berl., 1903, lxix, 223-248. (2) *Chiarabba, U.:* Gior. di ginec. e di pediat., Torino, 1906, vi, 97-101, 113-117. (3) *Chiarabba, U.:* Ann. di ostet., Milano, 1906, i, 190-198. (4) *Dominici, M.:* Virchow's Arch. f. path. Anat., Berl., 1911, ccvi, 392-406. (5) *Dominici, M.:* Atti d. Cong. pediat. ital., 1911, Palermo, 1912, vii, 375-377. (6) *Gargano, C.:* Gior. ital. d. mal. ven., Milano, 1924, lxv, 1712-1717. (7) *Livon, J.:* Compt. rend. Soc. de biol., Par., 1907, lxii, 981. (8) *Mohn, F.:* Ztschr. f. Geburtsh. u. Gynäk., Stuttg., 1907, lix, 263-312. (9) *Rietz, T.:* Arch. f. Dermat. u. Syph., Wien u. Leipz., 1912, cxi, 455-466. (10) *Seitz, L.:* Handbuch der Geburtsh., F. von Winckel, Wiesb., 1904, J. F. Bergmann, ii, 1179-1180. (11) *Simmonds, M.:* Virchow's Arch. f. path. Anat. Berl., 1912, ccix, 146-156. (12) *Simonds:* Verhandl. d. deutsch. path. Gesellsch., Jena, 1912, xv, 190. (13) *Thomsen, O.:* Beitr. z. path. Anat. u. z. allg. Path., Jena, 1905, xxxviii, 524-630. (14) *Thomsen, O., and Boas, H.:* Berl. klin. Wchnschr., 1909, xlvi, 539-542. (15) *Thomsen, O., and Boas, H.:* Arch. f. Dermat. u. Syph., Wien. u. Leipz., 1912, cxi, 91-116. (16) *Williams, J. W.:* Obstetrics, ed. 5, N. Y., 1923, D. Appleton and Co., 685-686. (17) *Ziegler, E.:* Lehrbuch der allgemeinen Pathologie und der pathologischen Anatomie für Aertze und Studierende, Jena, 1905, G. Fischer, ii, 1038.

PREGNANCY FOLLOWING THYROIDECTOMY

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THE enlargement of the thyroid gland during the early part of pregnancy has been observed for many years and it has even been felt certain that a number of pathologic thyroids are activated as a result of gestation. It is generally believed that the enlargement of the gland is a normal concomitant in from 65 to 90 per cent of all pregnancies. In searching for the causes of sterility, occasionally it will be found that small doses of thyroid gland may be of aid in overcoming sterility. It is also well known that patients with either a hypo- or hyperthyroidism generally have a definite menstrual disturbance, either an amenorrhea or a menorrhagia, both of which conditions may be alleviated or even apparently cured by the use of thyroid gland, regulated by careful checking up with metabolism readings. One writer[1] calls attention to the simultaneous occurrence of tumors in the thyroid, uterus, and breast. In two hundred cases, one hundred fibroids and one hundred thyroids, 50 per cent of the patients had both thyroid and uterine tumors and 5 per cent had breast tumors as well. A one time favorite explanation of eclampsia was that it was a result of a thyroid disturbance based partially on the fact that patients entering the last trimester of pregnancy with signs of impending toxemia, such as headaches, edema, urinary disturbances, might be relieved by doses of iodothyrin. Some men are of the opinion that women with exophthalmic goiter should not marry or at least if they do, should not become pregnant. The apparent association of the thyroid and the sexual apparatus is well shown by[2] "the increased size of the thyroid often observed at puberty; the thyroid disturbance at the time of menopause; the frequent swelling of the gland during menstrual periods, pregnancy and lactation; the thyroid hypertrophy seen in animals after experimental castration; the influence of sexual activity upon the thyroid with the occasional onset of Graves' disease as a result of sexual excesses; the rare onset of hyperthyroidism after oophorectomy."

There is practically nothing in the literature regarding pregnancies that follow thyroidectomy and the usual feeling is that a patient who has had a thyroidectomy performed, apparently will resume her normal manner of living and probably have children with little or no disastrous results. It is without doubt true that with the carefully studied patient the thyroid treatment will restore her to normal life and she may have normal children. It is, however, to be particularly emphasized that altogether too frequently patients consider the operation as the cure, rather than as part of the process of recovery and instead of following a careful régime until all symptoms have subsided, go about as though they never were ill. Operation is merely an incident in treatment and should be considered as such rather than as an immediate cure. This series of cases as presented might modify to some extent the feeling that at any time after a thyroidectomy, all things being equal, the patient may be assured that she will have a more or less uneventful pregnancy and produce normal, healthy children.

It is a fair statement that the excellent results which are being obtained in the treatment of thyroid disease are due to a careful study of the patient from a standpoint of metabolism, rest in bed, radium, x-ray, surgical interference or a combination of these methods. It must be urged again that the follow-up of the patient together with specific instructions in regard to daily life has much to do with the success or failure of the treatment.

During the years 1921-1925, 706 patients suffering with thyroid disease entered the Western Pennsylvania Hospital and of that number 507 were operated upon, all but eleven patients recovering and being discharged as improved. There were four colloid tumors and 40 toxic adenoma. The results, as reported through answers to follow-up letters sent one year after hospital discharge, showed that there were entirely well, 22 of the hyperplastic cases, 18 of the exophthalmic, 8 of the toxic adenoma and no change took place in 6 exophthalmic cases.

Slight improvement (symptoms still present such as weakness, rapid heart, palpitation) in 30 toxic adenoma, and 16 exophthalmic goiters.

Some improvement (symptoms still present, tires easily, nervous, rapid heart on exertion) in 36 toxic adenoma and 16 exophthalmic cases. Marked improvement (slight nervousness, occasional rapid heart) was noted in 44 toxic adenoma and 34 exophthalmic goiters,—a total of 274.

The great value of these replies is in the fact that they present the patient's point of view or that of one of her near relatives and give

TABULATION OF CASES

Primiparae, 26; multiparae, 22.

White, 34; Negro, 14.

Multiparae, 12 had living children previous to operation; 9 had miscarriages previous to operation.

Average age, 26.

Average number of years married before thyroidectomy, 4 years.

All but three said they had never used contraceptives and might be termed sterile.

Duration of symptoms before operation, 4 to 11 months.

CHOICE OF TREATMENT

Thyroidectomy after rest in bed	34
Thyroidectomy after ligation	7
Thyroidectomy after x-ray treatment	3
Thyroidectomy after radium treatment	4
Number of surgeons operating	10

RESULTS

Type of Thyroid:	Toxic Adenoma	15	Well
		7	Marked improvement
		1	Some improvement
	Exophthalmic	14	Well
		6	Marked improvement
		2	Some improvement
	Benign	4	Well

Months intervening before delivery, 9 to 43 (Three were operated upon during pregnancy). Average, 21 months

Complications in Mothers,	Eclampsia	3
	Placenta previa	1
	Dementia	1
Complications in Babies,	Melena Neonatorum	5
	Enlarged Thymus	3
	Enlarged Thyroid	4
	Palpable Thyroid	2
	Stillborn	2
	Acephalic Monster	2
	Cretin ?	1
	Mongolian idiocy	1
Babies apparently normal		28

DATA IN REGARD TO ABNORMAL BABIES

Toxic Adenoma (Maternal)	Enlarged thymus	2	(One stillborn)
	Melena neonatorum	3	(All recovered)
	Enlarged thyroid	2	
	Cretin ?	1	
	Thymus	3	
	Premature	1	
Exophthalmic (Maternal)	Enlarged thyroid	2	
	Melena neonatorum	2	(One died)
	Congenital heart	1	
	Slow development	1	(Child did well on thyroid medication)
	Anencephalic	2	(One with enlarged thyroid as well)

an accurate picture subjectively of her actual condition without too many leading and suggestive questions.

This paper deals with the question of pregnancy following thyroidectomy with an attempt at analyzing the forty-eight cases observed from the standpoint of symptomatology and treatment together with an inquiry in regard to the possible causes of the actual phenomena present. It is true that forty-eight cases is not a large series and it may be true that the results observed during the pregnancy in the mother and the conditions occurring in the infants may be a mere coincidence but the abnormal figures presented would seem to be more than accident.

As far as the mothers were concerned there were certain symptoms we would expect, nervousness, with unstable blood pressure, restlessness, constipation, nausea and vomiting. The treatment for the most part consisted in definite rest periods in bed each day during the first three months. Two patients were kept constantly in bed for sixteen weeks. Palpitation, shortness of breath and fear were among the most troublesome of features. For alleviation of symptoms bromides were used in varying doses alternating with other soporifics such as veronal, given in five-grain doses every other night. No one soporific was given over any extended period of time. For constipation, fruit juices, buttermilk and simple laxatives, the saline preferably, were employed, the laxatives given in small repeated doses rather than in one large dose daily. Constipation was the most difficult matter to obviate and when the cathartics were ineffective enemata were resorted to every other day. Thyroid preparations in small doses, grain ¼ to one grain b.i.d. seemed to be of value but not absolutely so, for frequently the patient would become nervous and complain of headache as well and the medication would have to be discontinued temporarily. A simple preparation of iodine such as syrup of hydriodic acid, fifteen drops every other day for pregnancy period together with calcium lactate in five-grain doses, seemed to be of aid but here again two patients reacted badly and iodine was stopped. Generally speaking, the majority did fairly well after the fourth month, especially if there was the least swelling about the thyroid scar, in other words if the portion of gland remaining was sufficient for function. The vomiting cases were obstinate and had to be put to bed on a rigid régime, starting in with fluids by rectum only, and gradully building back to the normal diet again. One patient went through this experience three times and two others twice.

Of the mothers all the multiparae went through to term. All the primiparae but two went through to term, of these one miscarried at three months and one died of eclampsia in her seventh month. Of the maternal thyroid type, where the babies were affected as shown in the following table there occurred ten toxic adenomas and twelve exophthalmic goiters. None of these mothers was well after operation and all complained of weakness, nervousness and palpitation. All the babies were born within two years of the operation. It is regretted that only nine of the mothers had metabolism readings taken and they were all primiparae. The readings ranged from +22 to +44, in other words all these patients were still showing evidence of thyroid disturbance and were not well following operation or else the pregnancy had been questionably responsible for starting the recrudescence of the old condition.

DISCUSSION

It should be noted that in every case where difficulty with the baby occurred, pregnancy and delivery occurred within two years after the thyroidectomy. In every case the mother had not recovered from the effects of the operation and in practically every case had complained of the same symptoms as before operation, although she may have been improved as far as the original condition goes. It is a self-evident fact that for a successful result in thyroid treatment the patient must obey instructions implicitly in regard to rest, medication and diet following operation, and a pregnancy should not be considered until she is as well as the accepted tests prove her to be. All were married for some time before their operations and all asserted that they had never done anything to prevent pregnancy, this apparently bearing out the usual testimony that patients with thyroid difficulty either do not become pregnant, or else miscarry early in gestation. It has been noted repeatedly that exophthalmic types either become markedly worse and miscarry before the third month or else rapidly improve if they remain pregnant and pass the first trimester without accident. In the cases where the baby was born with enlarged thyroid the mother's symptoms decreased in severity as the pregnancy proceeded. In the eclampsia patients there are a few factors worthy of note: The symptoms came on suddenly with no warning; two recovered and one died. All three had unstable blood pressures in that the least exertion or excitement would cause a variation of as much as sixty points. The patient who died had seventeen convulsions; the two living had six and nine convulsions respectively. None showed albumin in the urine until after the onset of convulsions and the amount increased as the condition proceeded. All had fever when first seen after their seizure, ranging from 102° to 104°. All three had been seen within three days of the attack and blood pressure and urine showed nothing abnormal. During the eclampsia the highest blood pressure recorded was 145 systolic. The blood chemistry was essentially negative, aside from the not unusual ratios between the N.P.N. and U.N. of 3:1 instead of 2:1. There was no marked increase in the uric acid content and none in the carbon dioxide tension reading. There was no edema in any of the patients and in one patient only was there a warning sign of headache, which the patient discounted and disregarded. Subjectively during pregnancy these three patients were intensely nervous, easily tired and troubled with rapid pulse. They had obstinate constipation. The thyroid region at no time showed the least evidence of swelling about the scar. The question could be raised here as to whether sufficient thyroid tissue had been left to function throughout their pregnancy and as to whether there might not have been interference from the parathyroids so that the eclampsia might be termed an endocrine one rather than one where the forewarning signs of rising blood pressure and edema promised an eclampsia of faulty elimination.

As far as the infants are concerned it is impossible to definitely pick out certain types of abnormalities where we might say that given a mother with a toxic adenoma we might prophesy the type of abnormality likely to occur in the baby. It is fairly well established that babies born of goitrous mothers may also develop goiter, and for that reason the prophylactic use of iodine during pregnancy may guard the child in utero. In this series it was found that all mothers did not tolerate iodine well and again it reverts back to the question as to whether the disease in the mother was not still present as evidenced by the symptoms and that the disease in her must be treated as such. The definite relationship between the two cannot be doubted. It has been shown[3] that if a partial thyroidectomy be done in dogs, puppies with markedly enlarged thyroids, probably due to the attempted compensation for the maternal deficiency, will be born. Guggisberg and Kehrer[4] found that thyroid extract definitely increased uterine contractions and this may account for the fact that patients with hyperthyroidism at the time of labor definitely suffer severely from vigorous uterine contraction. It must be admitted that the patients here as presented, probably in the first place were severe cases and the problem of treatment required great care and study. They have been the poorer risks and when the extra load of pregnancy is thrown upon them there is not sufficient reserve to stand the strain.

Therapeutically all patients must be treated cautiously and if thyroid or iodine is given it must be with the careful observation of the effect upon the patient. One of these patients, an exophthalmic type, with placenta previa, was packed postpartum with iodoform gauze and within an hour she had a temperature of 104°, a rapid thready pulse of 160, and it seemed as though she was not going to live. The pack was removed and within an hour all symptoms had subsided and she was sleeping quietly. It is an open question as to whether the absorption from the pack may have caused the trouble. Ten days later she was given a single 5 drop dose of Lugol's solution and again she showed a temperature of 101° and a pulse of 136. Four hours later she was apparently normal. McCarrison's work[5] on faulty diets and their effects on the endocrines must be borne in mind, especially where we have a relative loss of iodine together with an excess of fat in the food. The value of metabolism readings is of the utmost importance for the check-up on patients and their treatment.

CONCLUSIONS

1. No thyroid patient after operation should become pregnant for at least two years, even though her symptoms be alleviated.

2. If a thyroid patient after operation becomes pregnant, we must treat her cautiously with iodine, thyroid substance, sedatives and rest.

3. Metabolism readings should be taken for the accurate estimate of the case.

4. The patient cannot be assured that she will have a normal baby if she is still having symptoms referable to the thyroid.

REFERENCES

(1) *Ballin and Moehlig:* Ann. Surg., Dec., 1922, p. 132. (2) *Novak, E.:* Menstruation and Its Disorders, Appleton Monographs, 1923, p. 276. (3) *Williams:* Obstetrics, ed. 5, Appleton's, p. 195. (4) *Feldman:* Antenatal and Postnatal Child Physiology, Longmans, London, 1920. (5) *McCarrison, R:* N. Y. Med. Jour., Mar. 15, 1922, p. 182.

805 HIGHLAND BUILDING.

THE VALUE OF THE SUGAR TEST IN THE DIAGNOSIS OF PREGNANCY[*]

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THE obvious advantage of a desirable clinical examination for the accurate determination of the gravid state has long been recognized. Numerous criteria have been suggested, from the complicated Abderhalden reaction to simpler observatory phenomena. It is not our purpose to recapitulate this store of information, but rather to discuss a single feature of it,—viz., sugar tolerance during pregnancy, and the utilization of this principle as a diagnostic aid. With a rather brief résumé we shall present the result of the observations made on the Gynecological Service at the Jefferson Medical College Hospital.

That pregnant women show a decreased tolerance to carbohydrate ingestion is a definitely established fact.

In 1895, Von Jaksch[1] and Lanz[2] described a resultant glycosuria from glucose ingestion in pregnant women. Confirmation of these findings have been presented at intervals, but it was the paper of Frank and Northmann,[3] in 1920, that created recent interest by presenting the principle as a diagnostic test in pregnancy and describing a technic. Their work, with technical modifications, has been followed by that of others with varying results, all dependent upon this principle, and several of these papers will be mentioned later.

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[*] Read at a meeting of the Obstetrical Society of Philadelphia, November 4, 1926.

Ehrenfest,[4] in a recent contribution, sets forth in a lucid manner the study of carbohydrate metabolism during pregnancy. His opinion is especially clarifying in distinguishing between, (1) renal diabetes; (2) alimentary glycosuria; (3) the glycosuria occurring during pregnancy. In the first condition he speaks of a low threshold and an increased renal permeability, and secondly he refers to a ''definite weakness within the mechanism of carbohydrate utilization.'' In the third type, however, he believes that it may be ascribed to a ''prompt lowering of the renal threshold, required during pregnancy as a protective measure in the face of greatly accelerated sugar mobilization,'' which shows a weakness ''only in a distinct lowering of her ability to assimilate properly one large dose of carbohydrate.''

Ehrenfest also outlines the rôle of the endocrines in the pregnant woman, theorizing in detail upon the changes occurring in them in relation to carbohydrate metabolism, and quoting liberally from the experimental work of many investigators. He concludes that it is these endocrine changes that combine to produce that type of glycosuria peculiar to the pregnant woman, in contradistinction to the carbohydrate metabolism occurring in the nonpregnant state. Recent investigations, however, scarcely bear out this interpretation, since the modern view, expressed by Kleesattel,[5] is that the sugar in the urine of pregnant women is correlated with low alkali reserve.

With the above principles in mind, it is interesting to consider for a moment the experiences of earlier observers in performing carbohydrate tolerance tests, excluding the phloridzin and the Roubitschek methods from the discussion.

Frank and Northmann's technic consisted in the ingestion of 100 gm. of glucose on a fasting stomach, after securing a preliminary specimen of blood and urine to be examined for sugar content. They then collected urine specimens every fifteen minutes for two hours, and blood specimens every hour for two hours. Considering 190 mg. per 100 c.c. of blood as top normal, they found that the glycosuria always appeared within one hour in positive cases. They reported 19 cases of pregnancy diagnosed in this way, with no failures, but observed that the test was unreliable after the third month of pregnancy.

Welz and Van Nest,[6] using a modified technic, found the test satisfactory in 95 per cent of the cases studied.

Hirst and Long,[7] in their first paper collected the results of a number of investigators, demonstrating a total of 247 positive results in 259 cases tested, and presented their own studies. In 15 confirmed pregnancies, 14 gave positive results up to the end of the fourth month, while 4 were positive and 3 were negative after the fourth month. They reported no positive results in the absence of pregnancy. In their second paper, the same investigators[8] reported 150 cases studied; in 88 cases definitely pregnant, the test was positive in 83 (94 per cent); in 62 nonpregnant cases the test was negative in 57 (92 per cent).

Bauer[9] reported satisfactory studies in both groups; Hofbauer[10] to a lesser extent. Williams[11] secured positive results in a small series of cases by the original technic, but showed discouraging results with some of the modifications.

Seitz and Jess,[12] on the other hand, reported 55 per cent of positive results and 57 per cent of negative results in nonpregnant cases. An unruptured ectopic pregnancy was negative. Zondek[13] and Hellmuth[14] concluded that the test was of rather doubtful value.

Dietrich[15] reported 64 per cent of positive results in pregnant cases, and quoted a similarly low percentage in the work of Hallauer, Freund, Sachs and Bathe as reported by the latter author.

Nurnberger[16] claimed that in abortion there is a positive reaction as long as most of the placenta remains attached, the same being true of ectopic gestations. He regarded this as an aid in the prognosis of a threatened abortion, claimed ability to thus distinguish between the latter and a complete abortion, but not between complete and incomplete ones, because of the degree of placental remnants remaining. His results in the diagnosis of pregnancy were uniformly correct.

Lembcke and Lindig,[17] while reporting gratifying results with the test, mentioned an ovarian cyst as giving a positive reaction.

SCOPE OF THE INVESTIGATION AND TECHNIC

Our attention was called to this subject by the satisfactory results reported by several investigators, notably Hirst and Long, and accordingly we commenced observations on the Gynecological Service at Jefferson Medical College Hospital in December of last year (1925). The modified technic of Hirst and Long was employed, using 120 gm. of cane sugar or glucose, dissolved in water, and flavored with lemon or orange juice, cane sugar in about half of the cases, and glucose in the remainder. It was pointed out by Rowe,[18] in a paper at Toronto in 1921, that it is immaterial whether one uses sugar or glucose in testing the tolerance. Withholding breakfast, a preliminary specimen of voided urine was secured, and labeled "No. 1"; then the sugar solution given, and specimens of voided urine secured at one- and two-hour intervals and labeled "No. 2" and "No. 3." All specimens were then examined for sugar by Benedict's method. If sugar was found in the preliminary specimen, a differentiation was attempted; if found in the second and third specimens, and not in the first, the test was regarded as positive, and a blood-sugar estimation performed. If negative for sugar, the test was classified as "negative" and no blood-sugar study made. In positive tests, glucose was regarded as the reducing sugar, since the fact has been rather definitely established, that with a negative preliminary specimen, the sugar appearing in the urine after the ingestion of glucose is the same, especially when Benedict's test is employed. Blood-sugar estimations in positive cases were made on the morning following, breakfast being withheld. The rather lengthy blood-sugar tolerance test was not considered essential. Rowley[19] of the Mayo Clinic has shown rather definitely that the average range for blood-sugar concentration in normal pregnant women is 0.09 per cent to 0.11 per cent, which is the same as that found in nonpregnant women.

It was decided to carry out the sugar tolerance tests on cases of actual or suspected pregnancy, intra- or extrauterine; threatened or incomplete abortions; postabortal or puerperal infections; complicated pregnancies: myoma of the uterus, simple or complicated; ovarian cysts; pelvic inflammatory disease; study cases of doubtful diagnosis, especially with abdominal or pelvic enlargements. In some instances, tests were carried out after uterine evacuations, and in certain postoperative abdominal sections, for definite reasons that will soon be mentioned. Sometimes, notably in ruptured ectopic gestations, the necessity of instant operation precluded tests being made. Unfortunately, as is so frequently the case, patients have signed releases and left the hospital before all the desired studies could be made. The investigations were continued until the latter part of October, 1926.

It has been our earnest desire to estimate the real value of the sugar test in the diagnosis of pregnancy; to determine its reliability in doubtful cases, both early and in the later months; to observe the results encountered in nonpregnant cases, and thus prove or disprove the desirability of the test as a practical aid to the obstetrician and gynecologist.

ANALYSIS OF RESULTS OBTAINED

Eighty-two sugar tolerance tests were carried out,—19 in patients found to be definitely pregnant, and 63 in nonpregnant cases. In the first group, 11 were positive and 8 negative; in the second group 20 were positive and 43 negative; 57.9 per cent and 68.2 per cent respectively, or 31.7 per cent positive results in nonpregnant cases. Let us briefly analyze these results.

Uterine Pregnancy Cases.—In 17 cases, the test was positive in 11, and negative in 6. All but one were three months' pregnant or less; with three exceptions these pregnancies were complicated: threatened abortion, 5; toxemias of pregnancy, 3; pyelitis, 3; salpingitis, gall bladder disease, and myoma of the uterus, each one. In two of the positive cases, the preliminary specimen was positive for sugar; both blood-sugar estimations, however, were normal. The highest blood sugar recorded was 158 mg. in a patient giving a positive test, and whose pregnancy was complicated by cholelithiasis. Ordinarily her urine was negative for sugar. In another patient, the test was negative three times, the blood sugar being 0.066.

Extrauterine Pregnancy Cases.—Four cases were studied. In two of the cases, in which the test proved negative, unruptured ectopic gestations were present, and were operated upon. One of these cases was particularly interesting. The patient had been admitted to the ward as an incomplete abortion, and it was reported that placental tissue was extruding from the external os. After several days' rest in bed, the temperature not being elevated, a curettage was done, with little resulting material. At this time some enlargement of the left adnexa was noted, but believed to be inflammatory, and the patient was treated accordingly. She felt exceptionally well for several days, when she began to complain of severe pain in her left side, accompanied by a rapidly enlarging mass above Poupart's ligament and definite signs of internal hemorrhage. Abdominal section was immediately performed, and a left ruptured ectopic pregnancy found with profuse hemorrhage into the left broad ligament. Fortunately the patient recovered, with the aid of blood transfusion.

In a third case, operated upon for pelvic inflammatory disease, in which the test was negative, an old tubal abortion, with considerable blood clot was found. In all of these cases, ectopic pregnancy had been considered nonoperatively. In the fourth case, operated upon as an emergency ruptured ectopic pregnancy, a positive test was secured two weeks after the operation. The blood sugar was normal.

Incomplete Abortions.—Of twelve cases studied, 8 were negative and 4 positive. Curettage was performed on 3 of the negative cases, and placental tissue removed in each instance, the other 5 subsiding spontaneously. In 2 of the positive cases, curettage was performed, and a week later positive tests again obtained. The blood sugar was normal. The other 2 cases subsided, signed releases, and left the hospital.

Nonpregnant Cases—Myoma of the Uterus.—In uncomplicated myoma of the uterus, 6 cases were positive, and 7 negative. The blood sugar was normal in these cases. In several of these patients, pregnancy was suspected, and secretion was present in the breasts of two. All but one were operated upon, or given radium.

Myoma of the Uterus and Inflammatory Disease.—In four cases, one was positive and three were negative. The blood sugar was normal in the positive case. There were no unusual features about any of them.

Pelvic Inflammatory Disease.—In 15 cases, there were 4 positive tests. The blood sugars were normal in these cases. Of the 11 cases giving negative tests, ectopic pregnancy was considered in 2; in 2 of those giving positive tests, a similar condition was thought of. All were inflammatory without doubt.

Postabortal Infections.—Of five cases, one gave a positive test. This patient was lactating, and also showed sugar in the preliminary specimen. The blood sugar was 0.081, and lactose was found in the urine. In one of the four cases giving negative reactions, pregnancy was considered, but ruled out definitely.

Ovarian Cysts.—Of three cases, one gave a positive test. Pregnancy was a possibility. The test was repeated a week after operation and was again positive. The blood sugar was normal.

Subinvolution and Endometrial Hyperplasia.—Two cases of subinvolution, and one of endometrial hyperplasia, gave negative results with the test. In the latter case ectopic pregnancy was considered on admission.

Ureteral Stricture.—Two cases fell into this group: one was positive, and one negative. In the former instance there was a question of retained placental tissue from a rather recent premature birth. The curet and the cystoscope decided the issue. The blood sugar was normal. The latter case was also admitted for study and the diagnosis made clear.

Cardiac Disease.—Two cases gave negative findings. The question of ectopic pregnancy and incomplete abortion was ruled out in each case.

Hydatid Mole, Tuberculous Peritonitis and Endocrine Imbalance.—A case admitted as a threatened abortion twice reacted negatively. Convinced that the patient was pregnant, she was discharged to return for dispensary observation. Instead she went to another hospital and was operated upon, an hydatid mole being discovered. A case of tuberculous peritonitis was negative. A positive test was secured in a patient twenty years old, admitted because of generalized abdominal pain. She was said to have never menstruated, and had at one time been on the medical service, when a diagnosis of congenital lues had been made. We considered her as an endocrine case as well. The blood sugar was normal, and a Roentgen study of the skull showed no pituitary pathology.

CONCLUSIONS

1. From the result of our studies, indicating less than 60 per cent of positive reactions, we conclude that the sugar test is not reliable as an accurate diagnostic aid in pregnancy. Decreased carbohydrate tolerance, however, as evidenced by women in the pregnant state, apparently differs from the renal or alimentary type of glycosuria, and is interpreted at the present time as due to the depletion of base in the body of the pregnant woman which is conductive to a lowering of sugar metabolism.

2. We have found the test of no practical value in determining the status of a threatened, incomplete or completed abortion.

3. The large number of positive results in the nonpregnant cases, less than 70 per cent being negative, further emphasizes the unreliability of the test, particularly since the question of the differential diagnosis from pregnancy arose in a number of instances. These positive reactions, with normal blood-sugar findings in all but one case, are probably explained upon the basis of an alimentary or renal glycosuria.

Following the discussion of my paper at the November meeting of the Obstetrical Society of Philadelphia, I carried out a series of sugar tests to meet Dr. Hirst's criticism, using 7.5 gm. of sugar to every 10 pounds of the patient's body weight, with the following results:

75 per cent of positive results in cases actually pregnant.
38.8 per cent of positive results in nonpregnant cases.

The percentage of positive results in nonpregnant cases exceeds that obtained in the first series studied; the percentage of positive results in patients actually pregnant is also higher than in the first series, but fewer cases were observed.

It demonstrates, however, that it makes little difference whether a definite amount of sugar, 120 gm. or 7.5 gm. for every 10 pounds of body weight is used in carrying out the test, and to our mind, the test cannot be relied upon in differentiating pregnancy from other intraabdominal conditions.

Space does not permit of a detailed discussion, but the differential diagnosis of pregnancy from other conditions was an important issue in a large percentage of the cases tabulated.

I take this occasion to thank Dr. Anspach, Chief of the Gynecological Service at Jefferson Hospital, for the opportunity of presenting these observations. Thanks are also due to the resident physicians, nurses, and laboratory personnel for their earnest cooperation, and to Dr. Morse, head of the Chemistry Department at Jefferson Medical College, for valuable suggestions.

REFERENCES

(1) *Von Jaksch:* Verhand l.d. Cong. f. Inn. Med., Wiesbaden, 1895, xiii, 535. (2) *Lanz-Wien:* Med. Presse, 1895, xxxvi, 1856. (3) *Frank and Northmann:* München. med. Wchnschr., 1920, lxvii, 1433. (4) *Ehrenfest:* Am. Jour. Obst. Gynec., 1924, viii, No. 6. (5) *Kleesattel:* Arch, Gynäk., 1926, cxxvii, 717. (6) *Welz and Van Nest:* Am. Jour. Obst. Gynec., 1923, v, 33. (7) *Hirst and Long:* N. Y. Med. Jour. and Med. Rec., Nov. 7, 1923. (8) *Hirst and Long:* Am. Jour. Med Sc., 1926, clxxi, 846. (9) *Bauer:* Zentralbl. f. Gynäk., Sept. 2, 1922, No. 46. (10) *Hofbauer:* Zentralbl. f. Gynäk., 1922, No. 9, 349. (11) *Williams:* Am. Jour. Obst. Gynec., 1923, v, 369. (12) *Seitz and Jess:* München. med. Wchnschr., 1922, lxix, No. 156, p. 6. (13) *Zondek:* Zentralbl. f. Gynak., May 27, 1922, xlvii, 851. (14) *Hellmuth:* Klin. Wchnschr., 1922, i, 1152. (15) *Dietrich:* Berlin klin. Wchnschr., 1922, ii, No. 28, 1403. (16) *Nurnberger:* Deutsch. med. Wchnschr., 1921, xlvii, 1124. (17) *Lembcke and Lindig:* Monatschr. f. Geburtsh. u. Gynäk., 1922, lvi, 283. (18) *Rowe:* Personal communication from Dr. W. Morse, Jeff. Med. Coll. (19) *Rowley:* Am. Jour. Obst., Gynec., 1923, v, 23.

(*For discussion, see page* 265.)

THE CASE-TEACHING METHOD IN GYNECOLOGY

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IN THESE days of an overcrowded medical curriculum it is necessary that each teacher give careful thought to the question of using most advantageously the limited time assigned to him.

The things which might be studied with profit are numerous enough to occupy a period of many times four years. The first problem, therefore, that the teacher must face is to determine, by elimination as well as selection, what things are to be taught. The second problem is to decide upon the manner of that teaching.

The guiding principle in selecting the subject-matter of a course should be the admitted fact that the purpose of the undergraduate medical curriculum is to train men for the general practice of medicine. Those who will eventually work in a special field must expect to get their special training later. A common fault of the specialist-teacher is to present his subject to undergraduates as he would to a class of intending specialists in that particular field. Perhaps the laboratory teacher is even more inclined to this fault than is his clinical brother. There is much truth in Dr. Ray Lyman Wilbur's statement that the specialist is at times a positive menace to the undergraduate student.

The gynecologic training of the future general practitioner must equip him along the following lines:

1. He should have a broad general idea of the scope of the gynecologic field and of its interrelations with other departments of practice.

2. He should obtain the greatest possible amount of personal experience in diagnosis, which is by far the most important item in his training. Other knowledge will come naturally with this; without this, other knowledge is useless.

3. He should have some acquaintance with the simpler methods of treatment as applied to common minor gynecologic ills.

4. He should know when to refer a patient for treatment to a specialist and what can be expected of such treatment.

The specialist-teacher faces a constant temptation to include other things in his course. The detailed histology and embryology of the female generative tract; microscopic gynecologic pathology; operative technic; controversial material; the particular hobby of the individual instructor, all of these are interesting, and all of them would be excellent things for the student to know. All of them must, however, be strictly excluded from the undergraduate course, so long as their inclusion in a limited program would in any degree force out other more essential things.

There are several teaching methods that can be employed in a clinical course. Among them are the didactic lecture, the formal quiz, the amphitheater clinic, the ward clerkship, the out-patient section-work, the informal conference, and the case-teaching exercise.

The tendency today is happily against any great amount of purely didactic work. A long course of such lectures on a clinical subject is likely to develop into one of two things, either a profitless review of the textbook, or a specialized discourse on the particular interests and views of the speaker, suitable for advanced but not for elementary students.

The formal quiz is an objectionable method, out of keeping with university standards of education. The few who recite may learn something from such an exercise, but the majority of the class spend a tedious and unprofitable hour.

Of all clinical subjects, gynecology is one of the least well able to employ the amphitheater clinic for undergraduate teaching purposes. Operative clinics before a class of future general practitioners are a waste of time; nonoperative amphitheater clinics are a waste of opportunity, since the cases could be studied much better by sections of the class.

The ward clerkship has many advantages, but these are as a rule to be obtained only after the student has become well introduced to the routine of the hospital. The short clerkships in gynecology which can be crowded into the undergraduate course are likely to involve a considerable waste of time.

The ideal way of teaching gynecologic diagnosis, with certain elementary facts about treatment, would be to have the student in the out-patient clinic for a year. At the end of that time he ought to be fairly well trained along the necessary lines. Since actually he can stay in the out-patient clinic only two or three weeks, it is necessary to find some supplementary short cut to knowledge.

Assuming that ninety hours in the third and fourth years are to be devoted to the teaching of gynecology, the following program is suggested.

1. Ten hours of didactic lectures, dealing in a very general way with the scope of gynecology and the general problems involved. These lectures should come in the third year, and preferably in the first term; at any rate, as far as possible they should be given before the student begins his clinical work.

2. Forty-eight hours of clinical teaching of small sections in the out-patient department, divided into twelve half-day exercises of four hours each. Three hours at least of each exercise should be spent in actual contact with patients. The other hour might be devoted to informal conferences on subjects suggested by the clinical material at hand, to the study of gross pathologic specimens, to the occasional demonstration of some special method of investigation in the clinic, and, rarely, to the witnessing of an operation on a case previously seen by the students. This out-patient work might come in the third or fourth year, but preferably after the lectures have been given.

3. Thirty-two hours of case-teaching. This should come in the fourth year, after the students have done their out-patient work.

While it is not claimed that forty-eight hours in the out-patient department plus thirty-two hours of case-teaching will be the equivalent of a year in the out-patient clinic, I do believe that such a combination will be much more profitable than forty-eight hours of out-patient work plus another thirty-two hours of out-patient work, or plus thirty-two hours in the wards, or plus thirty-two hours spent in any other way.

Forty-eight hours devoted to examining out-patients will give the student a fair elementary training of the eye and hand, and will do this as well, for all practical purposes, as would eighty hours similarly spent. Forty-eight hours in a busy out-patient clinic will not go far in training the student's mind to correct gynecologic thinking; eighty hours would not go appreciably farther. Thirty-two hours devoted to case-teaching, following upon the training of the eye and hand, will accomplish gratifying results along this line.

There are several advantages peculiar to the case-teaching method. For one thing, the instructor can marshal before his students in a series of thirty-two one-hour exercises a carefully selected array of cases such as the haphazard material of the out-patient department might not present in the course of many months. As a second thing, it is possible to present each case in its entirety, including actual treatment and end-result. In the third place, one can dwell upon the various features of the cases with a thoroughness rarely possible in the course of a busy clinic, and with a frankness which is often inadvisable in the presence of the patient.

It may be urged in objection that case-teaching is a reversion to the didactic methods which we are nowadays tending to discard. A little reflection will show that this criticism is unfounded. In some departments of medicine teaching without the patient would be decidedly impractical. In dermatology, for example, one look is probably worth more than ten printed pages. In gynecology, however, the situation is different. Here certain data must first be obtained through direct contact with the patient. Following this, one must then by a process of reasoning draw from these data conclusions as to diagnosis, and formulate plans for treatment. Such a process of reasoning can be carried out just as well if the necessary data are presented on paper, as when they are elicited at first hand. The keynote of the method is that it encourages the student to do individual thinking under proper guidance.

The case-teaching exercise can be handled with a fairly large section of students. Between twenty and thirty men make a section of convenient size; when the number is greater than thirty, it is difficult to keep the exercise on an informal basis. If two or three men take an active part in the discussion of each point that comes up, then one can expect to hear from the whole section during the consideration of a single case.

The best success of the method will depend largely upon the personal equation of the instructor. A certain latitude must be allowed each individual teacher in his manner of conducting the exercise, for thus each will accomplish the best results.

The following is a useful plan. A case is assigned at the beginning of the hour, and the opening five minutes are devoted to silent consideration. Then some student is asked to state in general terms the problem or problems involved. This contribution will serve as a point of departure, and discussion of the case can then proceed. Usually the first business will be to enumerate the various possibilities in diagnosis, with the points in favor of and against each. Data omitted from the case-record may be supplied by the instructor, who will in a general way guide the discussion into profitable channels. Most of the actual talking, however, should be done by the students themselves. They are led to advance ideas, and to comment upon and criticize those ideas. When a diagnosis has been reached, prognosis and treatment are taken up. These are discussed in the fullest detail, emphasis being laid upon the manner in which they would be presented to the patient in actual practice. Finally the treatment carried out and the end-result in that particular case should be made known, and the reason should be considered for any errors of judgment that are discovered. The study of the first case will usually occupy about thirty-five minutes. A second shorter case can then be taken up during the remainder of the hour; this may well involve a related problem which will throw further light upon what has been learned from the first case.

An alternative plan is to announce beforehand what cases are to be taken up at a stated exercise, thus giving the student opportunity for preliminary thought and discussion. This method makes for economy of time in the classroom, but may detract somewhat from the spontaneity of the exercise, as students are likely to come with more or less fixed ideas. In last analysis, the most advantageous manner of conducting case-teaching exercises will gradually be evolved by each instructor from experience with his own particular group of students.

A three years' trial of the case-teaching method in gynecology has convincingly demonstrated to me its value as an adjunct to other methods of clinical instruction. Perhaps the greatest proof of that value is the favor with which case-teaching exercises are received by students, for the modern medical student is, as a rule, very quick to discriminate between what is useless and what is profitable in his work.

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Vignes: The Etiology of Labor. Le Progrès médical, 1924, No. 35, p. 522.

After having discussed the various theories as to the cause of labor, Vignes, in summing up, states that although the onset of labor is attributed to fetal maturity, to the adaptability of the uterine muscle to contraction, or to the developing property of the decidua to separate, these factors are in reality only signs of ovular maturity and do not explain the etiology of beginning labor. He concurs with Avienne that at the appointed time labor begins by the "Grace of God."

THEODORE W. ADAMS.

CARDIAC STIMULATION BY MASSAGE AND ADRENALIN FOR SUSPENDED ANIMATION, WITH THE REPORT OF A CASE

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THE employment of adrenalin, as a cardiac stimulant, seems to be practiced universally. Heart massage is performed occasionally, but, according to the literature, is a rather rare occurrence. In the case reported here, both methods of stimulation were used, and with such gratifying results, that a report seems justified.

Functional activity of the mammalian heart may be restored by the following methods which have been demonstrated either experimentally or clinically. Stimulation by: (1) *handling* or touching; (2) *needling;* (3) *aspiration* of the heart cavities; (4) direct cardiac *electrization;* (5) direct *arterial infusion* through the carotid toward the heart; (6) *heart massage;* (7) direct *injection of adrenalin* into the heart. Some of these methods have been discarded because of the attendant danger and doubtful value.

In suspended animation of the heart, the muscle, though relaxed, is capable of contraction if stimulated. But, as the arterioles and capillaries are entirely relaxed, it has been shown that it is extremely difficult to raise the blood pressure to a higher level than 15 or 20 mm. This level of pressure is incompatible with life. The problem therefore, is to increase the peripheral resistance, and this may be brought about by the injection of the blood pressure raising principle of the suprarenal glands. The solution (adrenalin) may be injected directly into a vein or it may be given intravenously with normal saline. It may be injected directly into the heart muscle or into one of the chambers of the heart. Intracardiac injection is the most prompt and powerful form of heart stimulation known. It is said that this method of stimulating a failing heart (intracardiac injection) was first used about fifty years ago by Schiff, a German physiologist.

Adrenalin stimulates the cardioaccelerator and augmentor fibers, thereby increasing the force and frequency of the heart beat. These two factors lead to an increase in the blood pressure. It has been demonstrated that adrenalin, applied to blood vessels as long as one hour after death, causes contraction. Now if the solution is injected into the blood and can be distributed, peripheral resistance should result. By proper massage of the heart, the circulation, and hence the distribution of adrenalin, is increased. The blood pressure is increased in the various arteries, and when the pressure in the coronary artery reaches 30 mm. or more, the heart will probably resume its rhythmic contractions. Keen points out that it is easier to reestablish the rhythmic action of the heart than to resuscitate the vasomotor and respiratory centers.

Bardier and Stillmunkes succeeded, with intracardiac injections of epinephrin, in reviving dogs that had succumbed to chloroform poisoning. Gottlieb found that adrenalin, given to animals poisoned with chloral, maintained the action of the heart until the danger point had been passed. Kathe obtained similar results in animals in collapse after excessive doses of chloroform. Kathe and Duncan used adrenalin in collapse following spinal anesthesia with stovaine and cocaine. Four cases were reported: In two the heart sounds were inaudible, and in two the respiration had failed. All recovered. Kathe gave a weak solution intravenously. Duncan gave four (4) minims of the 1:1000 solution intramuscularly.

Massage is of no value (1) after coagulation of the blood in the heart has taken place, (2) after the myocardium has lost all contractility by postmortem changes, and (3) after complete cessation of activity of the respiratory and vasomotor centers, as evidenced by arrest of respiration and an extremely low arterial pressure.

Direct cardiac massage may be applied by one of three procedures: (1) Sternocostal or transthoracic route (thoracotomy), (2) Abdominotransdiaphragmatic route (laparotomy and incision through the diaphragm), (3) Abdominosubdiaphragmatic route which accomplishes all that can be expected of any method without the risks and bad effects that other methods might produce. Obviously then, it is the method of choice.

Technic.—An epigastric incision is made. The hand is inserted and grasps the heart through the thin relaxed diaphragm, taking care to not injure the latter by perforation. The heart is held as well above the apex as possible so as to contract the ventricles rhythmically, 20 to 40 times a minute, between the thumb and fingers. The massage, if effective, should be continued until the heart beat is regular and forceful.

In cardiac massage, it is evident that rapidity in instituting the procedure is necessary. It has been said that "restorative measures are never exhausted or completed in such an accident (collapse under anesthesia) unless direct cardiac massage has been tried." In some cases the response is immediate, while in others no contraction has been felt until five minutes or more have elapsed. Lemormant reported 25 cases in which he used the sternocostal route 16 times with 12 total failures, three temporary recoveries and one permanent recovery.

CASE REPORT

A colored, unmarried woman, 38 years of age and a laundress by occupation, was admitted to the Emory University Unit of Grady Hospital on February 5, 1923, *complaining of foul vaginal discharge of one year's duration, and backache* of intermittent severity.

Past History: "Has never been healthy," has had "female trouble" for the past ten years. Right lobar pneumonia six years ago. Influenza three weeks ago. There were no complications. Menstruation began at 13, periods normal until two years ago at which time they became "scanty, irregular and watery." She had some pain during the last two periods. She has never been pregnant. She had "bladder trouble" about eighteen months before admission to the hospital and a recurrence of it in October, 1922. She has had nocturia as far back as can be remembered. *Operations:* An enlarged cervical gland was removed four years ago. Bartholin's abscess incised two years ago. Posterior colpotomy one year ago.

Present Illness: Since October 1921 she has been troubled with backache, especially when standing. For two months, preceding admission, she has had a dull headache, and for the past three weeks has slept very little. About one year ago she had severe pains in the lower abdomen. An abscess was opened and drained through the vagina. Following that operation she remained in bed about four months and has never been well since. She has had a foul, purulent, vaginal discharge continuously since the abscess was drained. On admission tenderness was noted in both lower quadrants, with a soft fluctuant mass, about the size of a grape fruit, low in the abdomen and slightly to the left of the midline. This extended into the culdesac. A foul purulent discharge was observed draining through a small opening in the posterior vaginal wall. Temperature 99°; pulse 100; respiration 20. The urine and blood, including the Wassermann test, were all negative. A diagnosis of chronic pelvic abscess was made.

The temperature and pulse rate dropped to normal immediately after admission, but it was thought wise to enlarge the opening into the culdesac and secure better drainage. This was done on February 8, 1923 and about 5 ounces of foul pus were evacuated. Free drainage continued and, except for a slight reaction to the operation, she remained afebrile until the twentieth postoperative day. At this time the temperature rose to 103° and the pulse to 130. The discharge ceased. It was thought that the temperature was due to the absorption of toxins from the abscess and therefore the opening in the culdesac should be enlarged. This was done; drainage was reestablished and the temperature and pulse rate promptly dropped to normal. Her blood was reexamined, but no remarkable change was noted. On the thirty-third day the discharge stopped again. There was an immediate rise in the temperature and pulse rate. The abscess was reopened with subsequent return to normal of the temperature and pulse rate. At this time, however, it did not appear that the patient was getting any better. She was draining freely from the culdesac, and the temperature and pulse were normal, but the impression was that she was getting gradually weaker and the wise thing would be the performance of a laparotomy and attempt to remove completely, the abscess mass.

On the forty-sixth day (March 26, 1923) under ether anesthesia, the abdomen was opened by midline incision. The entire pelvic cavity was found to be a mass of adhesions. The uterus was enlarged to half again its normal size and was soft and boggy. The left ovary had undergone cystic degeneration with no evidence of normal ovarian tissue remaining. There was a left intraligamentous cyst about the size of an orange. It was freed from adhesions and removed with the uterus. The right ovary was in the culdesac and was simply a sac of pus almost as large as the intraligamentous cyst. It was found that this mass alone (i.e., the right ovarian cyst) had been opened by the colpotomy incision. This mass was ruptured by the manipulation, and on removal a large amount of foul thick pus escaped. The intestines had been packed off and the soiled area was sponged out following the escape of the pus. The uterine arteries were being ligated when the patient suddenly ceased breathing and the heart stopped beating. When the pulse and respiration were reestablished, blood vessels were quickly ligated and the cervical stump was suspended from the round ligaments. One Penrose drain and one tube drain were brought out through the abdominal incision and the abdomen rapidly closed.

At the beginning of the anesthesia, the patient was extremely nervous, pulse 100, strong and regular. Blood pressure, systolic 158, diastolic 100. About one hour after beginning anesthesia, the pulse suddenly became imperceptible, but in one minute's time it was found to be strong and regular at 130 a minute. About thirty minutes later she was breathing regularly, 24 to the minute, pulse of good volume at 130 a minute and the pupils equal in slight contraction. Suddenly, and for the second time, the pulse became imperceptible; breathing ceased and heart impulse could neither be seen, heard nor felt. Both pupils were completely dilated. The patient's head was quickly lowered. Artificial respiration was begun and the sphincter ani was dilated. Two c.c. of adrenalin chloride (1:1000 sol.) were injected into a superficial vein of the neck and 2 c.c. were injected into the pericardial sac. The right hand was introduced through the abdominal incision into the abdomen, and the apex of the heart seized through the unopened diaphragm. No impulse could be felt. Grasping the heart between the thumb and fingers, as high up on the organ as possible, it was rhythmically squeezed. After four minutes of suspended animation, a faint cardiac contraction was felt. This was followed by rapid trip-hammer-like throbs, weak at first, but gaining in force as the rate slowed down to rhythmic beats and the pulse was perceptible in the temporals. At this time, cardiac massage was discontinued, but artificial respiration was kept up. About two minutes after the cardiac impulse was felt, the patient gasped and oxygen was given. Artificial respiration was discontinued and she promptly stopped breathing. The artificial respiration was immediately resumed and continued until the breathing was regular. Leaving it off the second time, the respiration continued at a regular rate and the pulse was 150 to the minute. One pupil was contracted to pin-point size and the other remained fully dilated. (Cerebral embolus was suspected). Oxygen was continued until the abdomen was closed. The patient was returned to the ward with a pulse rate of 140 and of fairly good volume; the right pupil dilated and the left, pin-point. The pulse rate soon came down to 132 and eight hours later she reacted. At this time both pupils were equal.

For nineteen or twenty days following the operation she appeared to be very sluggish mentally. Feeding was more or less forced. The mental sluggishness cleared up in about three weeks and she stated that she had no recollection of anything that had happened since she was taken to the operating room and anesthetized. Evidently the deprivation of blood to the brain (during the period of suspended animation) had lasted long enough to cause changes in the cerebral mechanisms concerned in memory and the higher mental processes. At the time of her dismissal from the hospital, she had a ravenous appetite, good morale, walked about the ward and felt all right. At the present time (1926) she is enjoying excellent health.

REFERENCES

(1) *Bachmann, George:* Lecture on "Physiology of the Heart," Emory Univ. Sch. of Med., 1924. (2) *Bardier and Stillmunkes:* Compt. Rend. de la Soc. de Biol., Paris, Apr. 10, 1925, xcii, 1048. (3) *Bayma:* Jour. Am. Med. Assn., Mar. 14, 1925, lxxxiv, No. 11. (4) *Bickham:* Operative Surgery, i, 306-310, and iv, 41-43. (5) *Boden, Carl:* Lancet, March, 1923, i, 586. (6) *Colcman, Warren:* A Handbook of Practical Treatment, Musser & Kelley, p. 301. (7) *Crile:* Jour. Exp. Med., Dec. 17, 1906, viii, No. 6; Mutter Lect., 1908; N. Y. Med. Jour., Jan., 1909; "Hemorrhage and Transfusion," N. Y., Appleton & Co., 1909. (8) *Keen's:* Surgery, i, 88, v, 80 81. (9) *Keen:* Therap. Gaz., Apr. 15, 1904. (10) *Lee, W. E., and Downs, T. M.:* Ann. Surg., Oct., 1924, v, 80. (11) *Lemormant:* Gaz. Hop., Sept. 13, 1906; Rev. de Chirurg., Mar., 1906. (12) *Neihaus:* Munch. med. Wchnschr., 1905, xxviii. (13) *Ricketts, B. M.:* Tr. Sec. on Surg. Anat., Am. Med. Assn., 1906, pp. 504, 534. (14) *Schapiro, A.:* Zentralbl. f. Chirurg., Leipzig, Apr. 11, 1925, lii, 785-848. (15) *Sencert and Goss:* Arch. Prov. Chirurg., 1906, xv, 689. (16) *Tuffier:* Presse Med., March 19, 1902. (17) *Vogt, E.:* Munchen. med. Wchnschr., June 17, 1921, lxviii, 732. (18) *Warren, Richard:* Prin. & Pract. of Surg., p. 701. (19) *Zeller, O.:* Deutch. Ztschr. f. Chirurg., 1909, xcv, 1-5.

436 PEACHTREE STREET.

VACCINATION OF PREGNANT WOMEN AND NEWBORN INFANTS

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THROUGH a ruling of the Department of Health of the City of Detroit, all patients presenting themselves at the Prenatal Clinics; and also all patients admitted for delivery at the Herman Kiefer (Municipal Obstetrical) Hospital, are routinely vaccinated against smallpox. By the same rule all newborn infants are also vaccinated.

The question has been raised, "Can an unborn infant be immunized against smallpox by vaccinating the mother during her pregnancy?" If so, another question arises as to whether a mother, who has been successfully vaccinated within the past three years, can transmit this immunity to her unborn child. If the immunity of the mother can be transmitted to the child, then as her immunity wears off, the unborn child ought to become more susceptible in proportion to the time that has elapsed since the mother was last successfully vaccinated. Again, in contrast, does vaccination of the mother during pregnancy or immediately previous, actually convey any immunity to the child in utero? Or is the immunity, that a certain proportion of newborn infants have, just a part of the general immunity which they offer to all infection?

With the material of the prenatal clinics available, and inasmuch as the cases coming to the prenatal clinics eventually deliver at the Herman Kiefer Hospital, it was thought opportune to check on a series of 351 cases delivered in the service during the months of July, August, and September of 1926.

It is generally conceded that pregnant women may safely be vaccinated without any untoward effects, and without fear of complications. As early as 1903 LeLievre (quoted by Urner) advocated the vaccination of pregnant women in smallpox epidemics; and today this is done as routine in many clinics (Urner at Minneapolis), especially during smallpox outbreaks.

The series of 351 cases herein reported were all vaccinated on entrance to the Herman Kiefer Hospital. All but 31 of these had been vaccinated at some previous time in their lives. These cases were all in labor or at term when admitted. Regardless of how recent their scar (274 having been vaccinated during pregnancy at the prenatal clinics), all were vaccinated. Fresh vaccine was used and the scarification method employed was the "scratch" method, three horizontal scratches about 3 mm. long and 1 mm. apart crossed by two vertical scratches. The preliminary preparation of the skin consisted of washing with green soap, alcohol, and a final cleansing with distilled water. At the hospital as well as at the clinics, readings were made on the eighth day and all negatives were revaccinated. The date of the last previous positive vaccination was also recorded for future reference. Of the cases in which there was a positive reaction, 5 per cent evidenced symptoms of malaise, elevation in temperature, backache and discomfort. In not a single case was there any evidence of any threatened abortion, miscarriage, or premature labor.

All of our newborns were vaccinated with fresh vaccine on the first day. Here again the "scratch" method of scarification was used, the left deltoid being the area of choice except in a few instances of female infants where the mothers preferred the thigh region. Readings were made on the eighth day and all the negatives were revaccinated. In 14 cases there was a positive following a negative reaction, this being attributed to faulty technic.

The normal well-being and progress of the infant appeared unaffected, even though many severe local reactions occurred. In only

TABLE SHOWING THE NUMBER AND TYPE OF REACTIONS OBTAINED IN VACCINATING MOTHERS AND INFANTS

GROUP	LAST POSITIVE VACCINATION	MOTHER'S PRESENT REACTION		INFANT'S PRESENT REACTION	
	YEAR	POS.	NEG.	POS.	NEG.
I.	1926	0	80	57	23
II.	1925 1924 1923	19	96	60	55
III.	1922 1921 1920	3	20	14	9
IV.	1919 1918 1917	3	13	8	8
V.	1916 1915 1914	2	9	5	6
VI.	1913 1912 1911	2	6	3	5
VII.	1910 1909 1908	3	4	5	2
VIII.	1907 1906 1905	1	2	1	2
IX.	Prior to 1905	1	5	4	2
X.	Never Vaccinated Before	25	6	30	1
XI.	Vaccinated Before with No Take	15	36	38	13

one case of the entire series did a vaccinia occur characterized by typical exanthema. This infant recovered promptly. The temperature curves remained relatively unaffected, even though severe reactions occurred. Von Reuss, quoting Behm, Gast, and Wolff, calls attention to the absence of inoculation fever. Ablass, quoted by Klotz, explains this lack of temperature rise due to an immunity to the vaccine; whereas Mensching claims this to be a part of the normal physiologic thermal regulation property of the newborn. Klotz has also called attention to the relative infrequence of glandular swellings in the newborn. Our experience coincided with this.

The accompanying table gives the results of the series of vaccinations of both mothers and infants. The column to the extreme left indicates the year in which the last previous positive vaccination occurred. It will be noted that there were 80 mothers in 1926 with positive vaccinations, these having been vaccinated during their pregnancy. Of this group, 57 infants, or 71 per cent, reacted with positive vaccinations indicating failure of transmission of immunity from the pregnant mother to child. From 1926 back, the years are grouped in threes for convenience in tabulating and also assuming that a vaccination ordinarily gives an immunity for a three-year period. Group 2 consisted of 115 mothers of which number 19 reacted with positive vaccinations; and of this group 60 infants, or 52 per cent, were positive. From thence on the table indicates as to what the reactions were. Group 10, in which the mothers had never been vaccinated, showed a positive for infants of almost 100 per cent.

Immune reactions in the mothers were classified in the negative group. In the infants, no immune reactions occurred, the result being either a definite positive or negative.

Although the series of cases is small, yet several conclusions can be drawn from the results obtained.

CONCLUSIONS

1. Vaccination of the mother during pregnancy resulting in a positive reaction does not convey any specific immunity to the unborn infant, inasmuch as 71 per cent of the infants react with positive scars.

2. The immunity which is evidenced by the remaining 29 per cent is probably due to the general immunity which newborn infants possess, plus error from technic and poor virus.

3. Any immunity which is present is not sufficient to afford any protection, even from vaccination.

4. Previous positive vaccinations in the mother with repeated negatives following, although indicating an immunity to the mother, do not convey any immunity to the infant.

5. Women may be vaccinated with safety at any period of their pregnancy.

6. Newborn infants may be vaccinated on the first day after birth without undue symptoms and without any dereliction to their future welfare.

7. In clinics, routine vaccination of mothers and infants is advisable both for protection and for spreading civic health propaganda.

REFERENCES

(1) *Ablass:* Inaug. Diss., Breslau, 1889. (2) *Klotz:* Berl. klin. Wchnschr., 1910, No. 16. (3) *Mensching:* Arch. f. kinderh., 1920, lxviii, 24-48. (4) *Urner:* Am. Jour. Obst. and Gynec., Jan., 1927, xiii, 96. (5) *Von Reuss:* Diseases of the New Born, Wm. Wood and Co., N. Y., 1921.

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THE VALUE OF THE BLOOD SEDIMENTATION TEST IN GYNECOLOGY

Conclusions from 250 Consecutive Cases

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THIS investigation was undertaken in order to determine whether the blood sedimentation test offers additional information either of diagnostic or therapeutic value. Although the test was suggested over one hundred years ago, it received no thorough clinical study until recently. The fact that the earliest clinical applications were in obstetrics and gynecology has probably no real meaning and the general principles indicated in relation to infection may well hold a similar value in other fields of medicine. The condition in which increased sedimentation rate occurs *par excellence* is sepsis, and our most rapid rates occurred when there was incarcerated pus. Pelvic abscess cases showed consistently the most rapid rates, while septic abortions, with equivalent febrile and leucocytic reactions but presumably without collections of pus, were definitely slower.

We have watched with much interest the results of the reaction of blood sedimentation in a practically consecutive series of 250 gynecologic cases of all types, correlating the leucocyte count, the febrile reaction, and the clinical response of the patient, with the blood settling time. In these observations it was attempted to determine whether or not rapidity of blood settling, as such, might be of prognostic value as well as being of some diagnostic importance in gynecologic pathologic studies.

Technic.—The simplest technic possible was employed. A stand containing 10 glass Linzenmeier tubes, each with a diameter of 5 mm., having an upper mark to indicate at what height the tube contains 1 c.c. and a second mark which is always 18 mm. below the upper one. First 0.2 c.c. of sodium citrate are placed in the tube. This is used in a 5 per cent solution. We place 0.8 c.c. of blood in the prepared tube, mix thoroughly, and note the time. The sodium citrate prevents the coagulation and a sinking of the red cell level below the upper mark is soon noted, leaving a column of yellowish-green plasma. The stand must be kept in exactly vertical position and at average room temperature. Keeping it in the icebox, we obtain almost the same results as in room temperature, but if it is kept in the incubator a highly increased speed is produced. As the speed is not constant but becomes slower in the lower part of the tube on account of increased density of the solution, a reading is taken when the red cell level has reached the lower mark 18 mm. from the upper one. Then the time is noted again.

A normal rate was established on healthy young women as a control. In a certain proportion the white blood count was also available as an additional check. This showed the typical wide variation within the presumably normal limits ranging between 248 and 630 minutes, averaging 446 minutes in 17 individuals. Values in men, being between 503 and 810 minutes, averaged 673 minutes. We have no explanation for the disparity between the sedimentation rates of the sexes.

Results.—Observations are reported upon cases of acute and chronic inflammatory disease of the pelvis, upon pregnancy and its complications, and upon benign and malignant neoplasms as well as upon uncomplicated uterine displacements.

TABLE I, PELVIC INFECTIONS

	NUMBER OF CASES	SEDIMENTATION TIME (MINUTES)		WHITE BLOOD COUNT		TEMPERATURE	
		RANGE	AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE
Pelvic abscess	15	5-30	16	21,000-9,000	18,000	39.2-36.9	38.2
Acute purulent salpingitis	40	12-66	26	27,500-4,500	11,000	40.0-36.9	37.7
Chronic inflammatory disease	40	58-240	151	15,800-5,100	9,200	37.5-36.6	37.2
Infected abortions	5	30-65	42	22,500-11,300	17,100	39.2-36.9	38.5

These cases were of the most interest to us because the febrile reaction and the degree of leucocytosis are constantly used as an index of the time for operation for the individual patient. Our lowest readings (i.e., always below thirty minutes, in one case even decreasing to five minutes) were obtained with pelvic abscesses which were usually associated with a definite elevation of temperature and leucocytosis in excess of 15,000. Pelvic abscess averaged sixteen minutes.

Cases with acute purulent salpingitis but without large abscess cavities also gave rapid sedimentation rates. Many of these were afebrile and had no leucocytosis, i.e., under 10,000 W.B.C. The latent infection thus is betrayed by the sedimentation rate and it may be the only sign that the patient has serious pelvic disease which requires attention, if the vaginal examination is equivocal. In our experience operation is not absolutely contraindicated, in the absence of fever and leucocytosis, when the sedimentation rate is very rapid, but it is safe to say that the speed of the sedimentation, the activity of the infectious process and the postoperative morbidity have a definite relationship. An increasing sedimentation rate may, however, be the signal for intervention for the evacuation of pus if the condition of the patient suggests that operation is preferable to expectant treatment. Subsiding salpingitis shows reduction of the rate, which changes very rapidly if any exacerbation occurs.

On a small series of desperately ill patients shown by autopsy or blood culture to have an overwhelming systemic infection, we found the sedimentation rate to be increasing or maintaining its rapid level whether the leucocyte count was high or low. It is noteworthy, however, that in cases of a large pyosalpinx or pelvic abscess with thick wall wherein the patient showed only a slight elevation of temperature and a white blood cell count ranging from 10,000 to 15,000, the sedimentation rate was quite as rapid as in cases of the flushed toxic patient with a tremendous leucocytosis and a high temperature. Repeated examinations of patients showing the most rapid rates of sedimentation gave no fluctuations which were of any prognostic value whatever.

The great proportion of cases with the most rapid rates, i.e., ten to thirty minutes as against the normal standard 248 to 630 minutes, made a prompt and entirely satisfactory recovery following surgical intervention (completion of abortion, pelvic puncture or salpingectomy). Three cases dying of sepsis of pelvic origin showed sustained rapidity of sedimentation on the day of exitus. From our results, therefore, the rate of sedimentation gives no information whatever whether or not the disease process is necessarily to be a lethal one.

In a series of 40 cases of purulent salpingitis where there was a gross purulent inflammatory disease in the tubes, the sedimentation ranged between twelve and sixty-six minutes and was above thirty minutes in only eight. The 20 cases in Table II are quoted to illustrate the consistency of the reaction in purulent salpingitis.

Chronic pelvic infections (salpingitis and parametritis) gave values between 75 and 255 minutes for complete settling of the erythrocytes in a series of 40 cases. These all were afebrile and all white blood

TABLE II

NO.	SEDIMENTATION TIME	WHITE BLOOD COUNT	TEMPERATURE
1	21 min.	7,580	38.0
2	20 min.	9,200	38.8
3	19 min.	11,100	37.2
4	26 min.	18,000	37.3
5	44 min.	8,500	37.4
6	27 min.	13,000	37.6
7	15 min.	9,500	36.6
8	30 min.	7,650	38.6
9	17 min.	------	37.0
10	15 min.	10,800	37.0
11	28 min.	6,800	39.0
12	29 min.	10,400	37.2
13	22 min.	9,800	37.0
14	36 min.	9,200	38.2
15	17 min	14,650	40.0
16	20 min.	13,300	37.4
17	32 min.	11,800	37.0
18	19 min.	18,800	38.0
19	13 min.	27,500	38.2
20	23 min.	14,700	37.6

cell counts were below 10,000. The blood settling time was reduced to an extent which we learned to interpret as typical of chronic inflammation, i.e., chronic metritis, salpingitis, ovaritis and appendicitis. Acute appendicitis in a very early stage gives a slower elevation from the normal than salpingitis of the same grade, which would indicate that the size of the lesion is perhaps a factor, salpingitis in its incipiency involving a greater tissue area than appendicitis.

In infected abortions the speed was uniformly increased, but was not always consistent with the temperature elevation and the white blood cell count. Typical sedimentation values ranged from sixty to twenty minutes. Postoperative phlebitis has in several cases given very rapid sedimentation, values ranging from twelve to forty-three minutes.

PREGNANCY

The sedimentation rate in 10 cases of normal pregnancy which we had the opportunity to examine fluctuated between 128 minutes at two months to 11 minutes at the eighth month. The test was originally applied to the diagnosis of pregnancy (Fahreus[3]). The increased speed, however, is not striking, in our experience, until the diagnosis of pregnancy is unmistakable by vaginal examination. Unruptured ectopic pregnancy gave rates between 251 and 286 minutes, which is without value from diagnostic standpoint. The test may occasionally be of value in differentiating the symmetric myoma from the pregnant uterus. A myoma, provided there is no degeneration, should cause little increase in speed, while the increase is fairly striking in a four to five months' pregnancy. There is also a definite increase at menstruation, the time varying between 160 and 256 minutes in a series of 5 normal women.

NEOPLASMS

1. *Myoma.*—Uncomplicated myoma gave a slight increase in sedimentation speed, ranging from 175 to 270 minutes in 10 cases, in average 215 minutes. These cases showed leucocyte counts within normal limits and were without exception afebrile. Degenerated myomata in afebrile cases with normal white blood counts showed markedly increased rates. This point is of value in the application of radium where degeneration of an otherwise uncomplicated myoma is suspected. This is in accord with Linzenmeier's results, who found myomata varying between 60 and 246 minutes. A rapid sedimentation with a myoma is an indication for immediate operation as it signifies probable necrosis of the tumor.

2. *Nonmalignant Ovarian Tumors.*—In six cases we found sedimentation reactions of normal range when they were not complicated; eight cases with ascites and adhesions showed increased rapidity, which corresponded roughly to the degree of peritoneal irritation as shown by thickening and formation of plastic adhesions and exudation of fluid.

3. *Carcinoma.*—The speed of sedimentation was increased uniformly in malignant neoplasms, the sedimentation being most rapid when the tumor is rapidly growing or giving rise to metastases or when it is breaking down. After radiation in cases of carcinoma of the cervix with regression of the tumor and amelioration of the symptoms, the sedimentation rate slowed markedly, approaching normal readings. Average time in carcinoma was forty-one minutes in 15 cases, ranging from twenty-two to sixty-seven minutes. It is of interest that in cases of cervical erosions and ectropion requiring frozen section to rule out malignancy, the sedimentation time was invariably in complete accord with the microscopic diagnosis, being 70 minutes or below in malignancy and above 150 in cervical erosions.

ANATOMIC VARIANTS (UTERINE DISPLACEMENT WITHOUT LESION)

Upon 16 patients with prolapse, relaxed vaginal outlets, retro- or anteflexion or retroversion of the uterus, normal sedimentation rates ranging from 240 to 463 minutes were obtained, provided there was no other pathologic change present. Our attention, however, was called to the presence of latent inflammatory disease in an apparently uncomplicated retroversion when low rates were found in several cases.

CONCLUSIONS

1. The velocity of the sedimentation of the erythrocytes gives information of value in establishing the diagnosis when considered in relation to the entire clinical manifestation.

2. The velocity of sedimentation does not indicate the patient's resistance to infection and is not of demonstrated prognostic value.
3. When there is neither fever nor leucocytosis, the velocity of sedimentation may aid materially in the diagnosis of suppuration in the pelvis.
4. In spite of exceptions the velocity of sedimentation is generally directly proportional to the extent or severity of the inflammation or both.

REFERENCES

(1) *Baer, R., and Reis, J.:* Surg., Gynec. Obst. 1925, xl, 691. (2) *Cherry, J. L.:* Am. Jour. Obstet. Gynec., 1926, x, 105. (3) *Fahreus, R:* Biochem. Ztschr., 1918, lxxxiv, 355. (4) *Friedländer, B.:* Am. Jour. Obst. Gynec., 1924, vii, 2. (5) *Hoeber, R., and Mond, R.:* Klin. Wehnschr., 1922, i, 2412. (6) *Linzenmeier, G.:* Zentralbl. f. Gynäk., 1920, xliv, 816. (7) *Noyes, J. H., and Corvese, A.:* Boston Med., Surg. Jour., 1926, cxcv, 891.

BENIGN UTERINE BLEEDING: A PRELIMINARY REPORT*

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THIS report deals with a few interesting and unusual cases of benign uterine bleeding seen at the Massachusetts General Hospital during the last three years and presents certain suggestions concerning the underlying causes of menorrhagia and metrorrhagia. It makes no attempt to deal with the usual causes of uterine bleeding such as fibroids, acute inflammations, polyps, senile atrophies, and malignant diseases.

Some of the cases are isolated and may not prove to be frequent, but represent types that have been studied in this clinic. Many of them seem to interlock one with the other, but there is something distinctive about each of them. There are cases under such headings as hypothyroid, hyperthyroid, thrombopenic purpura hemorrhagica, atypical purpura hemorrhagica, endocrine, and cases with no definite pathologic findings.

As slight variations from the normal in the condition of the blood may be very important, a person especially trained in hemocytology is essential in the clinic. The same is true of the endocrine aspects of the work.

The report also attempts to show that uterine bleeding is not as simple as once believed. Various workers have made definite suggestions of causes other than simple hyperfunction of the ovaries or hypertrophy of the endometrium.

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HYPOTHYROID TYPE

Mrs. F. W., aged 39 years, had been under observation in the Out-Patient Department for a year for severe uterine bleeding and given various sorts of medical treatment without success. She was then studied further in the hospital and the only definite findings were a basal metabolism of minus 17 and a secondary anemia. This was on Feb. 16, 1924. She was curetted and the pathologic examination showed hypertrophy of the endometrium. To check the bleeding 50 mg. of radium were placed in the uterine cavity in a rubber catheter for twenty-four hours. She had at this time none of the characteristics of myxedema and the low metabolism was taken to be simply a low normal. When next seen in the Out-Patient Department her bleeding had stopped and she felt very well. A metabolism test was repeated and found to be minus 27. On April 21, 1924, two months later, it had dropped still more and she was sent into the hospital for study of her then very apparent myxedema. Later under thyroid extract therapy she again menstruated, but her periods have been irregular and scanty.

The above case, although the only one as striking in this series, suggests that perhaps there is a very definite association between a hypersecreting ovary and a hypofunctioning thyroid. It suggests that the ovary in some way compensated for an abnormally low thyroid secretion and that in consequence of the hypersecretion of the ovary the patient had menorrhagia. When the overactivity of the ovary was checked myxedema soon developed. This raises the question as to the importance of the ovary as an organ of internal secretion and seems to point out that conservation may be very important. Probably a few cases of hypothyroidism or even myxedema have been created by their removal. It led to a basal metabolism test being done on most of our benign uterine bleeding patients and to a more intensive search into the relation between the various types of thyroid disease and the menstrual cycle. It aided the belief that patients with uterine bleeding may have metabolic rates lower than normal and those with high metabolic rates may have scanty or no periods.

A number of cases seen in the thyroid clinic with hyperthyroidism had amenorrhea. Some had no change in their menstruation, but enough showed definite abnormality to warrant a study of this group. Certain patients, following operation for toxic goiter, who have amenorrhea, regain their normal menstrual cycle as a result of the operation and the return of the metabolism to normal.

HYPERTHYROID TYPE

A patient in this group, D. N., aged 36 years, had always had normal periods every twenty-eight days and flowed for four or five days. She had had nose bleeds preceding her periods since the age of fourteen. Following an operation on her perineum she had bled a great deal. She developed hyperthyroidism and this apparently caused no change in her menstrual flow. In the hospital the bleeding time was four and a half to five minutes on many occasions, the platelets were always less than normal and often spoken of as individually large. The coagulation time was 14.5 minutes. After many consultations it was decided to operate upon her for hyperthyroidism. Her metabolic rate had reached plus 40. It is possible that a partial cause for the increased metabolism might be due to her secondary anemia. The operation consisted of removing about five-sixths of her thyroid gland. Four hours later it was necessary to reopen her wound and resuture. Two days later the wound was again reopened because of a large hematoma and resutured.

One month later her periods had increased in amount and Dr. Arlie V. Bock, associate physician to the Massachusetts General Hospital, wrote as follows when asked to see her in consultation: "This patient falls into the group of atypical purpura without thrombopenia and without change in the blood except for a coagulation time of twenty minutes and with some increase in the bleeding time. She has no history of spontaneous purpuric spots in the skin but has all the rest of the picture. She might respond to deep x-ray therapy over the spleen which should be tried out first before other measures."

High voltage x-rays were given over the spleen in September, 1925, and her October and November periods were normal. Later the uterine bleeding became more severe and in January, 1926, a series of deep x-ray exposures over the pelvis produced an artificial menopause. The patient dates the onset of new difficulties from this series of x-ray treatments, and although her periods stopped she was far from well, complaining of weakness, tired feeling, aching pains, sleepiness, lack of reaction to low temperature, and hot flushes. Her metabolism, June 5, 1926, was minus 12 and later was reported as minus 25. She developed a real myxedema and with thyroid extract has been made to feel perfectly well again. Her periods have never returned.

This is another very interesting case in somewhat the same category as the first. It is difficult of interpretation, but as Dr. Bock suggested in a later consultation the bleeding might be of endocrine origin. Perhaps the high metabolism was due to thyroid disease and partly the anemia. On removal of the gland it is possible that more was removed than was warranted by the real thyroid disease present and consequently the ovary began oversecreting with resultant menorrhagia. Then this hypersecreting ovary was checked by x-rays with a later fall in the metabolism to the level of the thyroid tissue remaining and a real myxedema developed.

This adds another case to those showing the close connection between the thyroid and the ovary, and if the above interpretations of the two cases are in any way true, it demonstrates that destruction of ovarian tissue should be avoided wherever possible.

The return of the patient's periods to normal for two months after the high voltage x-ray exposures over the spleen certainly warrants further study of this form of treatment in "atypical purpuras" as suggested again below. Perhaps she did not have amenorrhea during the anemia and hyperthyroidism as might have been expected because of the "atypical purpura," and thus the bleeding she did have was really pathologic.

Also another "atypical purpura" is added to the ever increasing number.

THROMBOPENIC PURPURA HEMORRHAGICA

A girl aged fourteen years, (L. E.) who had been in the hospital previously with thrombopenic purpura hemorrhagica, and who had had four transfusions to stop nasal bleeding, started flowing three months before readmission and did not cease until her hemoglobin was 35 per cent. Her blood platelets were "very low." The bleeding time was ten minutes and clotting time five minutes, with a poor clot retraction at the end of four hours. Another test gave the bleeding time as forty-five minutes. Transfusion and splenectomy were done and two days later the platelets and bleeding time were normal. Her uterine bleeding stopped almost at once and her periods have been regular and normal.

Here is a very definite case of purpura hemorrhagica with few platelets, long bleeding time, short coagulation time and poor clot retraction. The uterine bleeding is to be attributed without question to the disorder of the blood. This case well illustrates the necessity of a very complete blood study in all cases of bleeding from the uterus without obvious cause.

"ATYPICAL PURPURA" TYPE

A patient (V. R.), aged 34 years, with a diagnosis of "atypical purpura" hemorrhagica made on long coagulation time, history of purpuric spots and a palpable spleen, had long continued uterine bleeding. She was treated with a series of high voltage x-ray exposures over the spleen and a cessation in the abnormal bleeding was noticed in about six weeks. This suggested in cases of "atypical purpura hemorrhagica" a trial of x-ray treatment over the spleen before resorting to splenectomy or before destruction of the function of the ovaries to stop the uterine bleeding.

Another patient (F. T.), aged 34 years, had had long and frequent periods for fourteen months before admission. The blood was not markedly abnormal, but Dr. Arlie V. Bock on seeing the patient in consultation wrote the following of her history and blood study on June 16, 1925: "The only history of bleeding in this woman appears to be from the cervix and the uterus. She has had no nosebleeds, no black and blue spots, or bleeding following tooth extraction. Her prolonged coagulation time and bleeding time suggest physical alteration of the blood and it may be that her bleeding is from the cervix because of slight disease there. The blood smear is normal. She may have purpuric bleeding and in view of the results of two recent cases I should feel it worthwhile to give a course of x-ray treatments over the spleen and see if a therapeutic result is obtained before resorting to surgery * * * * *."

Her metabolism was normal. Her curettings showed hypertrophy of the endometrium. X-ray treatment over the spleen did not check her flow and so she was given a series over the pelvis. This caused a cessation of her periods. During her stay in the hospital, and for some time afterwards, she was questioned very carefully as to the appearance of petechiae or black and blue spots, but she always denied their presence. She had had no uterine bleeding since the x-ray treatments. Her cervix was amputated later for chronic endocervicitis and no excessive hemorrhage or bleeding was encountered, although her bleeding time was sixteen minutes and the smear showed reduction of platelets. A letter from her a few months after the cessation of her periods, however, stated that she had noticed fifteen to twenty black and blue spots on the inside and outside of both her thighs, and that there had been no injury to her thighs to cause them. She reported later at the Tumor Clinic and her observation was verified. She had about twenty small black and blue spots about ¼" to ½" in diameter scattered over her thighs.

These cases suggest that perhaps there is a definite group without true thrombopenic purpura hemorrhagica, but with an abnormal type of blood showing slightly prolonged bleeding time, or poor clot retraction, a long or short coagulation time, perhaps a palpable spleen or simply a definite history of purpuric spots appearing on the person that may enter into the cause of uterine bleeding. Here again it became necessary to do very complete blood studies. It is also of great importance to inquire into the spontaneous appearance of petechiae or black and blue spots, and to ask whether the patient noticed that following very slight bruising she found them. This can be brought out easily in the history but must not be confused with a blow sufficient to cause an ecchymosis in a normal patient.

BLEEDING FOLLOWING RADIUM AND HYSTERECTOMY

This patient (R. W.), aged 33 years, had incontinence of uterine and retroversion. A plastic operation was done on the urethra and a suspension of the uterus. Following this she began to flow very severely. Intrauterine application of 50 mg. of radium for twenty-four hours relieved the bleeding for eleven months. Later examination showed the uterus to be symmetrically enlarged and the patient much distressed by uterine bleeding. A supravaginal hysterectomy was done, leaving both ovaries. The microscopic examination of the uterus showed an endometrium of a single layer of cells and in places no endometrium at all. She ceased bleeding for a short time, but it commenced again and a blood examination showed another "atypical purpura." X-ray exposures over the spleen were given without effect and as a last resort they were given over the pelvis.

This case suggested the great resistance occasionally of the ovary to radium and that the amount of endometrium present has but little to do with the hemorrhage and that there may be other factors in uterine bleeding besides the ovary and uterus. X-rays over the spleen were also ineffectual. Dr. Beth Vincent, visiting surgeon to the Massachusetts General Hospital, did not consider this case a suitable one for splenectomy as the diagnosis of true purpura hemorrhagica could not be made. He stated at this time that the patient suspected of purpura should have the blood examined during the period of acute exacerbation of the bleeding before a diagnosis of the blood condition could accurately be made. It is probable that the blood findings are cyclic and that one examination does not rule out true purpura hemorrhagica or the "atypical" type of purpura.

This patient is robust, healthy, and with normal metabolism, and her bleeding, except for the annoyance, is of no apparent harm to her well-being.

CASES WITH NO DEFINITE PATHOLOGIC FINDINGS

A patient (E. S.), aged 37 years, had flowed for four years. She had had two series of x-ray treatments in another hospital, which caused a cessation of her periods for a short time, but they began again shortly after the treatments. The curettings showed hypertrophy of the endometrium. Her metabolism was minus 5, and blood normal except for a slight secondary anemia. No definite or suggestive reason except tho very slightly lowered metabolism could be found for her bleeding and so a supravaginal hysterectomy was done. The uterus appeared normal. Tho ovaries and tubes were left in place. She is now perfectly well, without bleeding, change in the blood, history of purpuric spots or change in her metabolic rate.

A great many cases fall into this group and more work must be done to locate a reason for their flowing. In the above case the metabolism of minus 5 may possibly be a partial reason, but glandular therapy was of no avail.

OTHER ENDOCRINE TYPES OF BLEEDING

These included cases without any pathologic lesions in young girls and young women. Their curettings showed only hypertrophy of the endometrium. These patients have been treated with thyroid extract and corpus luteum, many with excellent results. Some have been improved permanently and others still find it necessary to continue the use of one or another of the gland extracts.

Another type of endocrine disturbance is represented by a young woman thirty years of age who had severe menstrual hemorrhages and headaches. Her metabolism on two occasions was found to be definitely above normal. She did not seem to be a toxic thyroid type. A roentgenogram of her head revealed a definite enlargement of the sella turcica. It is possible that her bleeding may be caused by a pituitary disorder.

CALCIUM

In consequence of the recent work of Dr. Joseph Aub and Dr. Walter Bauer on metabolism of the inorganic salts and the finding of greatly increased calcium output in exophthalmic goiter cases and a small output in myxedema cases, it seems fitting to study the calcium metabolism of cases of uterine bleeding and the calcium metabolism of the menstrual flow. Especially is this true as some of the cases have suggested that uterine hemorrhage may be accompanied by low metabolism and amenorrhea by high metabolic rates.

The work at the Massachusetts General Hospital is being done along the following lines:

1. Statistical study of menstruation and uterine bleeding in hypothyroid and hyperthyroid patients.

2. A careful history must be taken of any change in the patients' subjective feelings that would lead to a suggestion of lowered metabolism: such as coarseness and falling of hair, dry skin, use of more blankets than usual at night, dulling of mentality, general tired-out feeling, etc.

3. Study of thrombopenic purpura hemorrhagica in women as a cause of uterine bleeding.

4. Study of various variations from the normal in the blood of uterine bleeders.

5. Careful histories of cases with regard to the question of petechiae, black and blue spots and easy bruising.

6. Study of the question of x-ray therapy of the spleen vs. splenectomy in mild and severe purpura.

7. Study of calcium metabolism in uterine bleeding cases.

8. Study of cases with no known or even suggestive cause of bleeding.

9. Study of endocrine disorders and the use of endocrine therapy in certain cases.

10. Study of the pathology of uterine curettings to establish whether most hypertrophies of the endometrium are not simply normal menstruating endometrium and that the former diagnosis is only occasionally the cause of benign uterine bleeding.

11. A more careful study of slight variations from the normal basal metabolism with gland therapy based on the findings.

12. To determine whether or not other cases than thrombopenic purpura can be benefited by ultra violet light therapy of the sort recommended by Sooy and Moise (*Jour. Am. Med. Assn.,* July 10, 1926) and found by them to be apparently curative for cases of thrombopenic purpura hemorrhagica.

CONCLUSIONS

1. In the clinic at the Massachusetts General Hospital instances have arisen that seem to suggest that some cases of hypothyroidism or myxedema may have larger periods than normal and that in consequence of a poorly functioning thyroid ovarian hypersecretion may develop with consequent menorrhagia. Destruction of the hypersecreting ovary may show the picture in its true light, disclosing a real myxedema.

2. There have been cases of uterine bleeding in young girls held in check by the use of thyroid extract and extract of the corpus luteum and in one case hyper- or hypopituitarism seemed to be the causal factor.

3. It seems definitely established that hyperthyroid patients often have oligomenorrhea or amenorrhea and that removal of the hypersecreting gland may return the menstrual cycle to normal.

4. It seems definitely established that true thrombopenic purpura hemorrhagica is a cause of excessive uterine bleeding, and that there is a group of patients with slight variation from the normal in their blood picture, a history of petechiae or black and blue spots, and possibly a palpable spleen that have excessive uterine bleeding.

5. It also seems definitely established that there are other causes aside from the ovary and the uterus for benign menorrhagias and metrorrhagias.

286 Marlborough Street.

LICHEN PLANUS OF THE SEMIMUCOUS MEMBRANES OF THE PUDENDUM MULIEBRE

By Douglass W. Montgomery, M.D., and George D. Culver, M.D.
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THE eruption of lichen planus of the semimucous membrane of the pudendum resembles more that of the mucous membranes than that of the skin, and therefore may be even more characteristic of this disease than the cutaneous eruptions, and consequently may constitute a decided aid in diagnosis. This may be, in the individual case, an important matter. There is always the danger of confusing the eruptions of lichen planus with those of syphilis, and when situated on the genitals, this is greatly increased.

Lichen planus of the vulvar mucous membrane is, to say the least, infrequent, although probably not nearly so infrequent as its infrequent mention would indicate. Like lichen of the mouth it may not cause uncomfortable symptoms, and therefore the patient may not know of its presence, or knowing, may not draw the physician's attention to it, and the physician just as naturally does not look for it. Gynecologists must see the condition oftener than other practitioners, but they seldom mention it. They are not interested in it, it is out of their line of thought, and they regard it only when forced on their attention by the patient complaining of discomfort, or when it is thought to be a venereal disease, or when it causes marked deformity, as for instance, kraurosis.

Just as one may have lichen planus of the cheek pouches or tongue alone, so one may have a lichen eruption confined to the genitalia. For instance, a Greek woman, forty-two years of age, consulted us for severe pruritus vulvae. She had a milky white coating over the whole vestibule, with some of the characteristic white lacework at the posterior commissure, which was sufficient to confirm the diagnosis.

Another woman, thirty-nine years of age, was sent to us for diagnosis. She had three white areas on the semimucosa of the labia majora, first noticed about one month previously. There was a faint indication of papulation, and there was the characteristic lacework, dimmed by the overlying white coating.

The following is an instance in which the vulvar condition was accompanied by many more symptoms, by a more generalized lichen planus.

A woman, aged fifty-three, consulted us for "white spot" disease of the back of the neck, the extensor surface of the right forearm and over the front of the upper part of the chest. Besides this there were a number of large angular lichen papules on the anterior surface of the right wrist. At a subsequent visit a few months later she drew our attention to the mucous membrane of the external genitalia. There was a thick leathery white coating over the whole vestibule, including the inner surface of the labia minora, and the meatus urinarius. There was a thick white coating also in the vulvo-thigh grooves, extending back along the perineum and including the anus. The mucous membrane of the vagina beyond the introitus looked and felt normal. The only itchy lesions were those of the genitals.

The labia majora were normal in size and appearance. The furrows between the labia majora and minora were slightly excoriated, and itched severely. The labia minora were elongated into large flat prominent flaps with a smooth leucoplasia-like surface that was particularly thick and white on the inner surfaces, and presented a white plaster-like patch to the right of the urethral opening. The prepuce was present, but the site of the clitoris was a sunken cavity, and there was no frenulum. The meatus was normal, pink, and the introitus was narrowed. During the time she was under treatment small numbers of typical lichen cutaneous papules made their appearance in different localities.

A very interesting feature of the case was that she should have two such rare manifestations of lichen ending in atrophy, such as the pudendal condition and ''white spot'' disease.

In this case we were witnessing undoubtedly a progressive atrophy of the pudendum muliebre, sometimes described under the name kraurosis.

The danger of confusion with syphilis is shown in one of our patients, who got a severe fright, thinking that her trouble was venereal.

She noticed two small white discs exactly bilateral, and situated one over the inner surface of each labium majus above the level of the clitoris. They had a strange weird appearance, like two staring eyes, and were quite startling to one who had a bad conscience, as our patient had.

Her trouble had begun two weeks previously on the forearms, where there were now some papules arranged in a linear manner. The whole dorsum of the tongue was covered by a white coating quite distinguishable from the usual coating from indigestion, and this coating almost extinguished a white lacework lying beneath it. Both cheek pouches were also occupied by the characteristic white lacework. There afterwards developed under the breasts a great many brownish red prominent papules with delicate linear marking on their top, as described by Louis Wickham. After some time the previously described pudendal white discs underwent a change. They became less white and two prominent lichen papules developed in the left one, corroborating their lichen nature. None of the lesions, either of the mucous membranes or of the skin, was accompanied by any subjective symptoms whatever.

The characteristic lesion of lichen planus is a small substantial papule covered by a thin scale, but one can have a lichen planus patch without papules, as for instance on the dorsum of the tongue, where it may occur as a white scarlike streak.

Recently a woman consulted us with an exquisitely itching area on the inner surface of the left labium minus that we regarded as being a patch of lichen planus. The woman was fifty-five years of age, thin, spare and faded looking, a true nervous type. To add to her nervousness she took too much tea and coffee. She was constipated and therefore flatulent, and to add to her flatulency she took too much easily fermentable food, such as sugar, potato, butter and cheese. All of which probably contributed to her misery. Her menstruation had ceased after an operation on the fallopian tubes ten years previously.

The patch of which she complained was about an inch square, and a striking feature of it was that the upper border was in a straight line. The surface was finely granular and brownish red. There was no papulation and only a slight induration. The pruritus had begun twenty-five years previously, had endured for some time, had ceased, and had begun again in 1906. The attacks of itchiness were severe and exquisite, and reduced her to a desperate condition. There were, however, no scratch marks, and there was no marked desquamation or cross-hatching, as of lichenification. The striking objective features were the straight upper border, giving the lesion a square artificial appearance, and, as the redness faded under treatment, the remaining brown pigmentation.

Whenever an eruption has an artificial appearance, as in the well-known streaked forms in lichen, one should consider either the possibility of an artificial eruption, or lichen planus. In addition to this there was the pigmentation so frequent in lichen planus. As the impression of lichen planus became stronger, we finally examined the mouth to find a well-marked typical lichen eruption in the left cheek pouch opposite the last molars. There were the white papules, some of which were stellate, and the white lacework, some of the trabeculae of which were unusually thick.

There was now no doubt that the patient had lichen planus; whether the affection on the labium majus was a neurotic eczema would of course be discussable.

Treatment as for lichen planus was instituted with radium, a tar-lead lotion, and measures looking to the correction of the patient's general condition, which soon brought about a marked amelioration of the tormenting symptoms.

The foregoing indicates that the recognition of the true nature of a lichen planus eruption of the semimucosa of the female pudendum may be of great importance because of the alarm it may occasion owing to its startling appearance, and because it may be mistaken for syphilis. Like lichen of the mouth it may also furnish substantial aid in determining the diagnosis of a puzzling cutaneous eruption. The differentiation of this condition from leucoplakia may also serve to relieve the patient's and the physician's mind from the fear implied, even if not expressed, of cancer.

As for treatment, this is *more often than not, disappointing.* As in oral lichen planus, our two main drugs in this disease, mercury and arsenic, more often aggravate, rather than ameliorate, the symptoms, and the treatment is therefore usually nonspecific and contemplates measures looking to the general health of the patient.

323 GEARY STREET.

THE USE OF RADIUM IN THE TREATMENT OF ENDOMETRIOMA OF THE RECTOVAGINAL SEPTUM*

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A CONSIDERATION of endometriomata or adenomyomata of the rectovaginal septum from the standpoint of treatment, leads us to divide them into three groups.

Group 1.—Small tumors imbedded in the upper part of the vaginal wall, usually posterior to the cervix, to which they are attached but which do not involve the rectum. In rare instances, they are found to be isolated and discrete and freely movable with the vaginal wall.

If located posterolaterally to the cervix, we find them in the uterosacral ligament or extending into the base of the broad ligament. They vary in size from 0.5 to 1.0 cm. The smaller ones are usually globular. The contour of the larger ones becomes irregular through the development of nodules of various size.

Group 2.—To this group belong endometriomata of sufficient size to involve the supravaginal portion of the cervix, upper vaginal wall and anterior rectal wall but remain confined to Douglas' pouch. They have not extended laterally to surround the ureter, posteriorly along the ureterosacral ligament to invade the lateral walls of the rectum or outward along the broad ligaments to involve the uterine adnexae and other pelvic structures.

Through the medium of the growth the cervix, vaginal wall and rectum become firmly adherent to each other to form an irregular mass, which may attain the size of an egg.

Nodules can be palpated beneath the involved vaginal wall, which is usually puckered at the area of its attachment to the tumor.

Group 3.—This group includes the most extensive of the endometriomata originating in the rectovaginal septum. They involve not only the cervix, vagina and rectum, but invade the broad ligaments, surround and constrict the ureters, infiltrate large areas of the rectum, narrow its lumen and eventually glue together the pelvic structures into an immovable mass, reminding one very much of a massive chronic pelvic cellulitis.

The etiology and pathology of endometriomata have been thoroughly studied by Sampson and Cullen, who have presented their views in numerous communications.

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*Read at a meeting of the Obstetrical Society of Philadelphia, November 4, 1926.

It would appear that not all the tumors of the rectovaginal septum are the result of implantation of endometrial cells regurgitated into the peritoneal cavity through the tubal canal during menstruation or which have escaped from rupture of an endometrial hematoma of the ovary. In some instances a direct connection between the tumor and the endometrium has been described, giving evidence of its origin in the uterine mucosa and subsequent penetration of the uterine wall.

Symptoms depend largely upon the size of the tumor and the involvement of the pelvic viscera. The tumors of Group 1 produce few, if any, symptoms and are usually discovered during examination for other diseases of the pelvic organs. The chief symptoms of Group 2 are pain and menorrhagia. Two types of pain are described: a grinding sensation in the lower abdomen and a distressing fullness or pressure in the rectum, aggravated during defecation. It is usually pronounced at the time of menstruation and is abated or even absent between periods. The exacerbation during the periods is ascribed to the swelling of the tumor, which is claimed by Cullen to occur in adenomyoma "no matter where situated."

Menorrhagia occurs in nearly all cases, either as a prolongation of the period or as excessive flow during a period of normal duration. Spontaneous bleeding from the rectum is occasionally present. Additional symptoms occur in tumors of Group 3 because of the pressure upon the ureters and pelvic nerves and the involvement of the tubes, ovaries, sigmoid, etc.

Constriction of the ureters produces unilateral or bilateral hydroureter with intrarenal pressure, especially during the menstrual periods.

The mode of treatment of endometrioma will greatly depend upon the size of the tumor and the degree of invasion of the pelvic structures.

Small tumors in the posterior vaginal wall whether discrete or adherent to the cervix are easily removed through vaginal incision.

The surgical attack upon the widespread endometrioma of Group 3 has consisted chiefly of its removal by painstaking and extensive dissection as has been so successfully done by Cullen in nine reported cases. Such operations necessitated occasional resection of the rectum, sigmoid and bladder.

Cullen, Graves, Keene and Sampson have observed regression in endometriomata involving areas of the rectum and bladder which were not resected at operations in which ablation of both ovaries had been performed. These results indicate that the activity of misplaced endometrial tissue, as represented by endometriomata, undergoes the same atrophic or regressive changes as normal endometrium when deprived of the influence of ovarian hormone. That such an effect upon adenomyomatous tissue is not uniform, however, is shown in one case operated upon by Cullen in which the tumor had continued to develop following bilateral oophorectomy performed by another surgeon two years previously.

The question has been raised by Armytage, whether regressive changes in the tumor result from the destruction of ovarian activity by x-ray therapy. In the treatment of tumors of Group 2, whose removal through vaginal incision is rendered difficult and dangerous because of their adhesion to the rectum or of their situation in the uterosacral or broad ligament, we are confronted with the problem of attacking them either by the methods employed in the treatment of Group 3, or of attempting to destroy the activity of the endometrial cells of the tumor by implantation of radium.

If satisfactory results can be obtained by the latter method, especially in young women, it would seem to be the method of choice, since it is easily and safely applied.

Herewith I present two cases in which the application of radium proved very satisfactory.

CASE 1.—A. S., aged 27, was referred to me in April, 1918, by Dr. Solomon Solis-Cohen with the following history: Menstruation had begun at the age of 13 and had been regular and painless. She had a curettage four years previously for uterine discharge but it was only moderately successful. In January, 1918, she developed pain in the hypogastrium which spread to both iliac regions and confined her to bed for about three weeks.

There was distinct tenderness over McBurney's point. On bimanual examination both ovaries were found to be tender and prolapsed. On April 24 through a Pfannenstiel incision I found both ovaries prolapsed and adherent in Douglas' pouch by friable adhesions. The tip of the appendix was found adherent to the right ovary; the adhesions were broken up and the appendix removed. The operation did not afford her complete relief for she continued to suffer from bilateral iliac pain and in addition, a sensation of fullness and pain in the rectum especially before menstruation. On examination in January, 1921, I found that the ovaries had again prolapsed. The left one was distinctly larger than on the previous examination and there was some thickening of the left uterosacral ligament.

Another abdominal operation was done on January 25, 1921, when both ovaries were again found to be adherent in Douglas' pouch. The left ovary contained multiple cysts and was about three times its normal size. Almost all of the left ovary was removed. The right ovary was placed anterior to the broad ligament through a button hole incision and sutured in its new position. The thickening in the uterosacral ligament was examined, the peritoneal covering was puckered and it felt like an old cellulitis.

Unfortunately the patient continued to suffer pain in the rectum, accentuated just before and during menstruation. The mass in the uterosacral ligament had become somewhat nodular by October, 1921 and I decided that it was an adenomyoma. Its removal, through vaginal or abdominal incision, presented distinct difficulties and furthermore I was loath to recommend another operation. I decided to attempt its destruction by the use of radium. On October 12, 1921, under nitrous oxide-oxygen anesthesia, the cervix was grasped in a tenaculum and drawn to the right. An incision was made through the vaginal wall beneath the left uterosacral ligament, in which the nodule of adenoma was felt. Through the vaginal incision six needles (each containing 12.5 mg. of radium) were introduced into the nodule. The radium was removed in six hours.

The patient remained under my obeservation for a few months after the radium treatment, during which time there was a vaginal discharge. The pain gradually subsided and the uterosacral mass decreased in size. I did not see her again until October 24, 1926, when she reported that menstruation had continued regularly, lasting two or three days. She has had no flushes or sweats; she feels better during menstruation than at other times and has had no return of the pain. On vaginal examination I found that with the exception of slight contraction of the left uterosacral ligament the pelvic organs were in good condition. It is interesting to note in this case that, in addition to the gratifying local results, the radium has not interfered with activity of the ovary or uterus as menstruation has occurred regularly.

CASE 2.—E. S., married, consulted me October 21, 1921 complaining of headache, nervousness, insomnia, severe dysmenorrhea and pain in the rectum preceding menstruation. She had had her appendix removed four years before. There was some tenderness in the right iliac region. On bimanual examination I found a flattened nodular mass adherent to the posterior vaginal wall, cervix and rectum. On inspection a rounded projection presented itself in the upper posterior vaginal wall. The diagnosis of adenomyoma of the rectovaginal septum was made and the use of radium advised.

I did not see the patient again until the latter part of October, 1925, when she told me that she had been operated upon in November, 1921. The removal of the right tube and ovary did not afford any relief. Examination revealed that the tumor had about doubled in size, but was still confined to Douglas' pouch and firmly attached to the surrounding structures. Radium was again advised and this time the advice accepted.

Under nitrous oxide-oxygen anesthesia on November 4, 1925 an incision was made in the vaginal wall through which four needles of radium, each 12.5 mg. were introduced into the tumor mass. The radium was allowed to remain in place twenty-four hours. The menstrual periods have continued regularly; the nervous symptoms have gradually diminished in severity; her general health has improved; she has gained twenty pounds in weight and the rectal pain has completely disappeared.

On examination October 15, 1926, I found that the tumor had markedly diminished in size and the nodulations had disappeared. In this patient we note again the continuation of menstruation after the use of radium and the complete subsidence of local symptoms.

I know of no published records regarding the use of radium in adenomyoma of the rectovaginal septum. In a private communication, Dr. C. Burnam gave me a record of three patients in whom radium was employed. In two of the patients the adenomyoma was recurrent after operation by Dr. Cullen. Burnam's results in the three cases were very satisfactory.

Judging from results, it would seem that there is a distinct field for the use of radium in the treatment of adenomyoma of the rectovaginal septum especially in those instances in which the tumor is not small enough to be easily removed through vaginal incision, and not so large that all of it cannot be brought under the influence of radium embedded within it. Its use in properly selected cases avoids the necessity for abdominal incision and unsexing the patient.

REFERENCES

Cullen, T. S.: Jour. Am. Med. Assn., Aug. 5, 1916, lxvii, 401. *Cullen, T. S.:* Jour. Am. Med. Assn., March 14, 1914, 835. *Cullen, T. S.:* Surg. Gynec. and Obst., March, 1915, 263. *Cullen, T. S.:* Adenomyoma of the Uterus, Philadelphia, W. B. Saunders Co., 1908. *Cullen, T. S.:* The Johns Hopkins Hosp. Bull., Nov., 1917, xxviii, No. 321. *Sampson, J. A.:* Am. Jour. Obst. Gynec., Nov., 1925, x, No. 5, p. 649-664. *Sampson, J. A.:* Arch. Surg., Sept., 1921, iii, 245-373. *Sampson, J. A.:* Surg., Gynec. and Obst., March, 1924, xxxviii, 287-311. *Sampson, J. A.:* Boston Med. Surg. Jour., April 5, 1922, clxxxvi, 445-456. *Sampson, J. A.:* Arch. Surg., Sept., 1922, v, 217-280. *Sampson, J. A.:* Am. Jour. Obst., 1918, lxxviii, 161-175. *Sampson, J. A.:* Surg., Gynec. and Obst., March, 1912, xiv, 215-230. *Graves, W. P.:* Am. Jour. Obst. and Gynec., Nov., 1925, x, No. 5, pp. 665-670. *Keene, Floyd:* Am. Jour. Obst. and Gynec., Nov., 1925, No. 5, pp. 619-625. *Armytage, Green:* Am. Jour. Obst. and Gynec., Nov., 1925, x, No. 5, p. 734. *Heineberg, Alfred:* Am. Jour. of Obst. and Dis. of Women and Child., 1917, lxxv, No. 3.

REPORT OF A BENIGN GIANT CELL TUMOR OF THE XANTHOSARCOMA TYPE*

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THIS paper presents a brief résumé of what has been written regarding xanthoma, especially in reference to the question of malignancy, and to report one such case.

These tumors are so called because of their characteristic yellow appearance (Gr. xanthos), and they may arise in any situation in which endothelial and connective tissue is present. They are first mentioned by Rayer in 1856 in connection with yellow plaques of the eyelids. The name given to these tumors is probably due to Lebert, who in 1845 called the yellow fatty substance "xanthos."

Sir James Paget in 1856 preferred the term myeloid tumors, and he mentions the finding of large multinucleated giant cells. He found such tumors in the mammary glands, conjunctiva, subcutaneous tissue and bone. Hertaux in 1891 described myelomas of the tendon sheaths with some yellow areas which contained an ether-soluble fatty substance. Broders reported 17 cases of benign xanthoperiosteal tumors of the extremities, 16 cases of which were in the tendon sheaths. Carroll Smith reported cases occurring in the tongue, labium majus, parotid gland and the dura. Miller reported cases in the tendons of the foot, the breast, and in the bones of the skull, vertebra, and the extremities.

Clinically there are three varieties of xanthoma: (1) xanthelasma which occurs in the eyelids; (2) xanthoma multiplex which is seen in widespread lesions of the skin, and (3) xanthoma which occurs as isolated tumors in many parts of the body and to which a wide variety of names is given.

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*Read before the Section on Obstetrics and Gynecology, Cleveland Academy of Medicine, Dec. 10, 1926.

The reason for this yellow color has been widely investigated by Pinkus and Pick, Pringsheim, Pollitzer and Weil, Darier, Burns, Smith and others, and is stated by Miller "to consist of a cholesterol fatty acid ester which is doubly refractive to polarized light. In fresh tissue fixed in formalin the lipoid granules appear as small yellow globules, when stained with Sudan III, and assume a gray color with osmic acid. When fixed in alcohol they are readily dissolved and leave behind small vacuoles which appear microscopically like foam, and have given rise in the literature to the term 'foam cells' and 'xanthoma cells.' This lipoid substance is deposited in the tissue and acts as a foreign body which is absorbed by the endothelial and connective tissue cells, with the formation of multinucleated giant cells." In Garrett's opinion, the pigment remaining from the absorption of degenerated blood gives rise to the color, whereas Fleissig believes that blood pigment has no association with the color. Miller believes that the two pigments, carotin and xanthophyl, belonging to the group of carotinoids, when combined with the cholesterol esters (which themselves are colorless) give rise to the yellow appearance.

The association of these tumors with such pathologic conditions as cholesterinemia, lipemia, diabetes mellitus, and icterus, has also been studied by numerous investigators, including Pinkus and Pick, Pringsheim, Pollitzer and Weil, Darier, Burns and Smith.

From the study of early cases by Pinkus and Pick, Pollitzer and Weil, Macleod and others, it has been shown that the initial phase consists in a dilatation of the capillaries, a proliferation of the perivascular endothelium and a deposit within the tissue spaces of a finely divided lipoid substance which in later stages is absorbed by the endothelial and connective tissue cells as a foreign material. This gives rise to the formation of large polyhedral cells with small nuclei and granular cytoplasm and is accompanied by a reaction in the formation of large multinuclear foreign body giant cells and an active proliferation of the fibrous tissue.

The large polyhedral cells or foam cells under the high power show small vacuoles where the lipoid substance has been dissolved through the use of alcohol in the preparation of the slide. This is analogous to the giant cell formation which not uncommonly is found about cholesterin crystals, in the walls of ovarian cysts, in the corpus luteum and in other conditions in which cholesterin is present. Here also the cholesterin is dissolved by alcohol and radiating clefts remain surrounded by giant cells.

Are these tumors malignant? Tourneaux collected 93 cases of xanthosarcoma of the tendon sheaths. He believes these may grow very slowly and then show a sudden rapid growth, or may be malignant from the start. In 21 of his cases there was a recurrence after local removal. Broders reported 17 cases of benign xanthoextraperiosteal tumors. Hértaux in 1891 considered myelomas of the tendon sheaths as benign, and Bellamy in 1901, because of the proliferation of the endothelium, called the tumors endotheliomas. Bloodgood in 1903 and 1905 classified these tumors as benign hemangiomas. Carroll Smith in 1912 believed the tumors to be benign and called them xanthomatous endotheliomas. Miller in 1924 very thoroughly reviewed the entire subject of xanthomata and concluded that by far the majority of tumors in which xanthomatous tissue is seen are benign in character and should be so treated surgically.

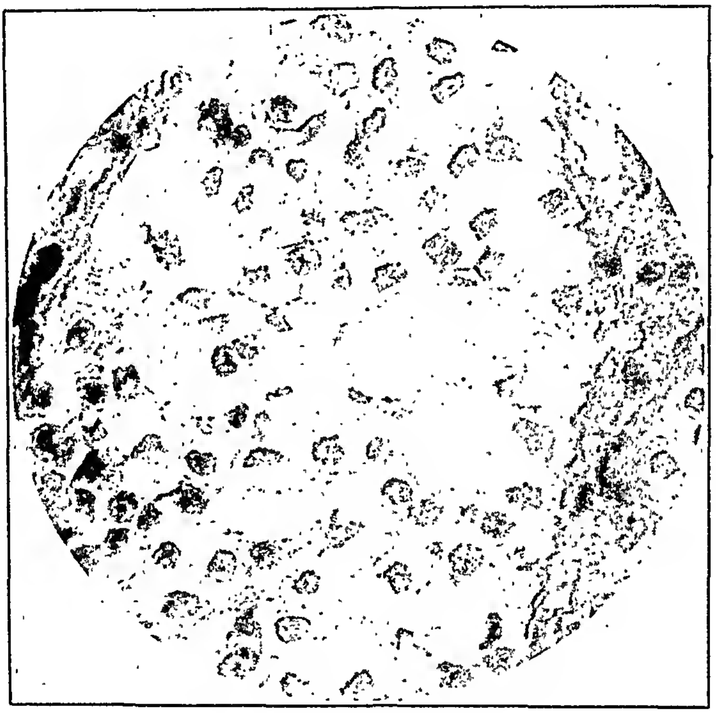

Fig. 1.—Giant cell tumor showing xanthoma or foam cells.

I wish to report one such case of benign giant cell tumor of the xanthosarcoma type occurring in the sacrum.

Mrs. A. B., aged 25, was admitted to Lakeside Hospital January 15, 1920. She had been married six months. The last menstrual period was January 2, 1920, and the previous period November 5, 1919. She complained of (1) backache for one month, less during the periods and worse on standing; (2) no menses in December; (3) slight dysmenorrhea at times; (4) slight leucorrhea for years. There was no history of menorrhagia, metrorrhagia or urinary disturbance. There were no symptoms of pregnancy. One grandparent died of cancer of the stomach and one of cancer of the breast. The previous history was negative.

The physical examination was negative except for tenderness and the presence of a firm mass about the size of an orange in the left iliac region. On vaginal examination the cervix was soft and pushed to the right. The fundus was forward, enlarged, globular and to the right of the midline. A tumor mass the size of a grapefruit could be separated from the uterus but was adherent to the pelvic wall posteriorly. The lateral structures were small and freely movable. The diagnosis was pregnancy complicated by a subserous uterine fibroid, adherent to the sacrum.

Through a median suprapubic incision, the abdomen was opened and in addition to a pregnancy of two months, a retroperitoneal tumor about 10 cm. in diameter was encountered arising from the sacrum in the region of the promontory and extending to the ileum. The peritoneum over the tumor was incised and an attempt was made to shell out the tumor with its capsule. This was so intimately connected posteriorly that the capsule was ruptured and a large quantity of spongy yellow material escaped. Beneath the area to which the posterior portion of the tumor was attached there were two areas of erosion of the underlying bone. Although there had been very little blood loss, the patient went into shock and the operation had to be terminated quickly. The capsule was hastily dissected out but it was evident that not all the deeper portion of the tumor, where it involved the sacrum, had been removed. Early the following morning the patient aborted. Following her operation she convalesced rapidly and was discharged from the hospital February 4, 1920. On vaginal examination at that time a recurrence in the sacrum as large as an orange could be palpated.

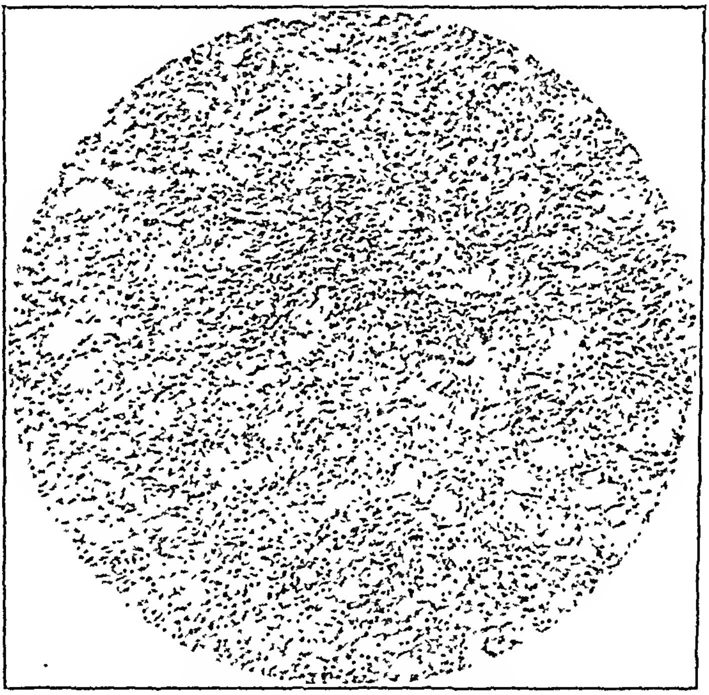

Fig. 2.—Giant cell tumor showing giant cells and diffuse infiltration of the fibrous tissue with xanthoma cells.

The histologic examination by Dr. H. Goldblatt showed that the tumor consisted of moderately nucleated fibrous connective tissue infiltrated rather profusely with lymphocytes. In addition to the fibrous tissue there were in all the sections large collections of *foamy* cells, which were rather large, polygonal in outline, having very light staining vacuolated cytoplasm with small nuclei that vary in shape and stain densely with basic stain. Some of the sections stained with Sudan III showed that only these foamy cells took up the stain and took it up intensely. In some of these sections the foamy cells appeared to infiltrate the fibrous connective tissue. There were no mitotic figures. A moderate number of capillary blood spaces were scattered throughout the tumor. Several sections from this tumor were sent to Prof. J. Ewing of Cornell University for examination and he corroborated the diagnosis of sacral xanthosarcoma, retroperitoneal.

When the diagnosis was made x-ray therapy was instituted and the mass very rapidly subsided. For a time menstruation ceased but this has now returned. At present there is no evidence of tumor either by digital or x-ray examination.

I am indebted to Dr. H. T. Karsner for the accompanying microphotographs of this tumor.

REFERENCES

Bellamy, H. F.: Jour. Path. Bact., 1901, vii, 465. *Bloodgood, J. C.:* Prog. Med. Dec., 1903, 154; Prog. Med. Dec., 1905, 264. *Broders, A. C.:* Mayo Clinic, 1919, xi, 1032. *Burns, F. S.:* Arch. Dermat. and Syph., 1920, ii, 415. *Darier:* Textbook of Dermatology, 1920. *Dor, L.:* Cong. de Chir., 1898, xii, 558. *Ewing, J.:* Arch. Surg., 1922, iv. *Fleissig, J.:* Deutsch. Ztschr. f. Chir., 1922, cxxii, 239. *Garrett, C. A.:* Arch. Surg., May, 1924. *Hertaux, M. A.:* Arch. gen. de Med., 1891, clxvii, 40. *Landois and Reid:* Beitr. z. Klin. Chir., 1915, xcv, 56. *Macleod, J. M. H.:* Brit. Jour. Dermat., 1913, xxv, 344. *Miller:* Ann. Surg., Aug., 1924. *Ollerenshaw, R.:* Brit. Jour. Surg., 1922, x, 466. *Paget, Sir James:* Surg. Path., 1856. *Pinkus and Pick:* Deutsch. med. Wchnschr., 1908, xxxiii, 1426; Deutsch. med. Wchnschr., 1908, xxxiv, 1246. *Pollitzer and Weil:* Jour. Cut. Dis., 1912, xxxiii, 235. *Pringsheim:* Deutsch. med. Wchnschr., 1908, xxxiv, 2145. *Smith, Carroll:* Surg. Gynec. and Obst., 1912, xiv, 551. *Tourneux, J. R.:* Rec. de Chir., 1913, xvii, 817.

524 OSBORN BUILDING.

Seliga, Michael: Treatment of Ectopic Pregnancy. Bratislavske Lekarske Listy, 1925, iv, 309.

Operative interference for an ectopic pregnancy is always required because even after the death of the fetus the Langhans cells of the chorion will continue their cytolytic action on surrounding tissues. Secondary hemorrhages from further erosion might prove more dangerous than the primary hemorrhage. Also the hematocele, even if encapsulated, should be removed. The remaining hematocele furthers the development of adhesions which may lead to various dangerous sequelae. For operation only the abdominal route should be taken and all free blood removed from the peritoneal cavity. If the contents of the ovisac are infected the operation may be carried out in two steps, during the first step, the peritoneum is fastened to the sac, at the second, the mass is opened for drainage. The author's total mortality in 103 cases was 9.5 per cent, almost always the fatal result being due either to chronic septicemia or extreme anemia. FROM THE AUTHOR'S ABSTRACT.

PORRO CESAREAN SECTION FOR POSTINFLAMMATORY DISPLACEMENT AND FIXATION OF THE CERVIX

By Robert A. Wilson, M.D., Brooklyn, N. Y.

(From the Department of Obstetrics of the Methodist-Episcopal Hospital)

THE following case is reported in some detail because a careful search of the literature has failed to reveal any other case with similar pathologic findings. In this instance not only was pelvic delivery impossible, but after delivery had been accomplished by the abdominal route the conditions encountered demanded further surgery. The end-result, after a careful follow-up, has fully justified the course of the surgeon at the time of operation.

Mrs. A. F., age 36, white, para ix, came under my care December 15, 1924. Her family physician believed her to be pregnant, but upon vaginal examination was unable to locate the cervix. An interview with the patient elicited the following interesting history:

She had enjoyed good health as a child and was married at the age of twelve. Menstruation began at fourteen, two years after marriage, was regular and never occasioned any discomfort. Her last period was May 5, 1924. She had her first baby when fifteen years of age, there were no complications and none of the subsequent pregnancies ever interfered with her health in any way.

Her present trouble began six years ago when she contracted an acute gonorrheal infection. An immense pelvic exudate developed, entirely filling the culdesac and extending for an indeterminate distance. Because of slow improvement, pain and disability, she entered St. Catherine's Hospital, Brooklyn, N. Y., March 17, 1919, and ten days later a posterior colpotomy was performed. Six weeks later a left salpingectomy somewhat improved her condition. For the next three years she was a chronic invalid, unable to take care of her home and October 5, 1922, was again compelled to enter the hospital for a third operation, which consisted of a left oophorectomy with the freeing of numerous adhesions. From that date until one year ago she required continuous medical care, suffering from lower abdominal pain, rectal tenesmus, nausea and general invalidism. In December, 1924, she consulted her physician stating that she believed she was pregnant. He expressed himself as being frankly skeptical, but examination revealed a fetal heart which confirmed her statement.

Because of her condition, severe pain, nausea and vomiting, she frequently contemplated suicide. She was admitted January 6, 1925, to the Methodist-Episcopal Hospital, Brooklyn, N. Y., on the service of Dr. R. M. Beach, in my care, for further study and in order to more effectually relieve her suffering.

Physical examination showed a woman about thirty-five years of age, pale and apparently suffering from pain in the lower abdomen. Heart and lungs were negative.

Abdominal examination revealed an old median hypogastric scar. The fundus uteri measured 32 cm. and was apparently contracting at short intervals. The fetal heart was normal.

Vaginal examination revealed a relaxed pelvic floor and a vagina which was greatly elongated and drawn upward apparently by traction from above. The cervix was very high and back of the pubis, irregular in outline, densely fibrous and firmly fixed by surrounding exudate. The lower part of the uterus also was immobile with a development of the fetus almost entirely at the expense of the posterior uterine wall. The uterine pains which were occurring were apparently due to the efforts of the restricted uterine body to empty itself of its contents. The presentation and position could not be determined and a rectal examination revealed nothing more of interest. Her laboratory findings were entirely satisfactory, hemoglobin 70 per cent, Wassermann negative and the blood chemistry normal. Her blood pressure was 120/60.

A diagnosis was made of pregnancy complicated by an old inflammatory fibrosis, displacement and fixation of the cervix with a complete obliteration of its canal.

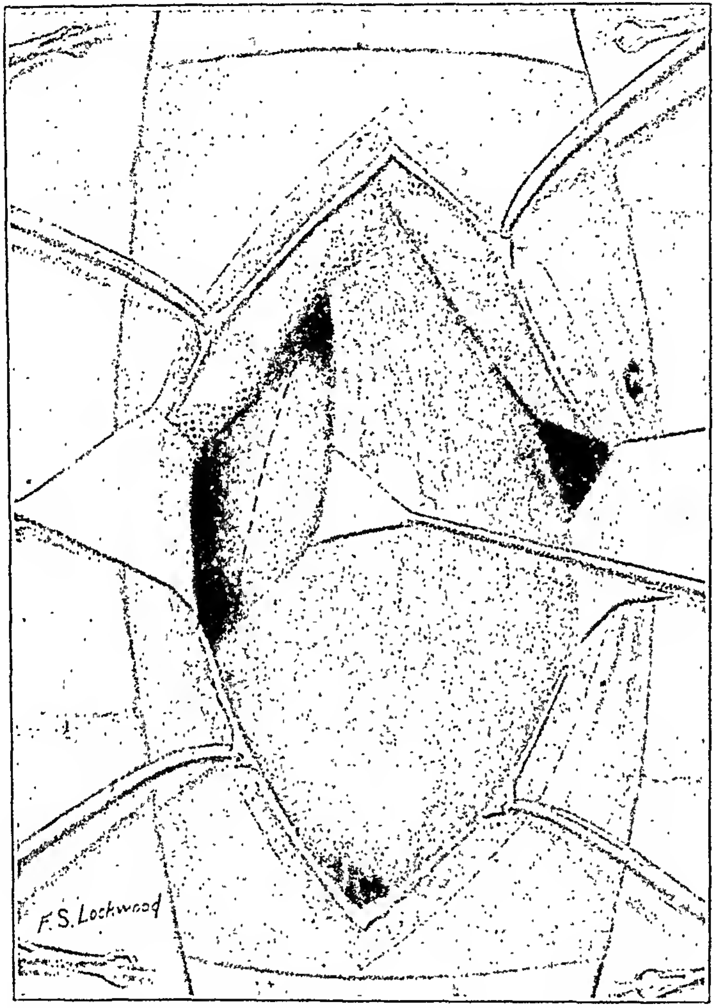

Fig. 1.—Bladder and bladder reflection covering anterior wall of uterus, and site of incision in uterus.

The recommendation was further observation, relief of pain, and an attempt to improve the patient's general condition until viability of the baby was assured, and this to be followed by a Porro-cesarean section for the following reasons:

1. To secure a live baby, as vaginal delivery was impossible.

2. To completely remove organs which were irreparably diseased and had caused marked disability before the pregnancy.

3. To remove the danger of defective drainage from the uterus, suture leakage and peritonitis.

The patient remained in the hospital for twenty-four days before operation, the pregnancy being estimated to be of 33 weeks' duration. An x-ray picture revealed a baby of average size presenting by the breech. During this period the patient received an average of three hypodermics of morphine in each twenty-four hours, in order to alleviate the severity of the pain. Altogether she received sixty-seven hypodermics of morphine before operation.

The operation was performed January 30, 1925, the fundus measuring 35 cm. and the fetal heart being normal.

An incision was made to the right of the umbilicus, avoiding the old scars. The entire anterior surface of the uterus, up to the fundus, was covered with a thick, fan-like, adhesive band which was found to be the bladder reflection. Apparently at a previous operation, this had been sutured to the raw area left by the removal of the left adnexa and had been drawn upward by the growing uterus. The bladder also was drawn up with this band and could not be easily distinguished. An area on the uterus near the upper right lateral aspect was exposed by partial separation of this band, the uterus incised, and the baby extracted by the feet. The placenta being removed manually, the uterine cavity was packed with a laparotomy sponge and a running catgut suture was used to temporarily close the uterus.

The band was densely adherent all the way down the uterine wall; the lower segment of the uterus and the cervix firmly fixed by an old inflammatory exudate, extending down the left pelvic wall and involving the sigmoid. The entire cervix was immensely hard and thickened; the right tube normal and the ovary elongated and somewhat cystic. Apparently most of the growth of the uterus had been at the expense of the posterior wall although there was no marked sacculation or thinning. Despite the technical difficulties it was evident that if this patient was to be cured of her long-standing disability, a complete cleaning out of the pelvis with the release of all possible adhesions was absolutely necessary.

The fan-shaped bladder reflection was separated from the uterus down to the cervicovaginal junction, and a separation of all other adhesions accomplished without damage to adjacent structures. A large tenaculum was next inserted into the uterus and upward traction applied, which showed very clearly the extreme fixation of the lower uterine segment.

A typical supracervical hysterectomy was done, leaving only a small amount of cervical tissue which was completely peritonealized. It was now observed that the sigmoid was tremendously dilated, being so large that it filled the entire pelvis. This dilation was due to a low annular constriction apparently of inflammatory origin. The abdomen was now rapidly closed as her condition was only fair; pulse 160, respirations shallow, and color very pale.

The patient quickly reacted from the operative shock and was out of danger in a few hours. Her convalescence was uneventful; there were no complications and she was discharged from the hospital eighteen days after operation. Her general condition was excellent and she was free from pain for the first time in many years.

The baby at birth weighed only four pounds, but thrived under care and when discharged weighed six pounds, two ounces.

The wound healed by primary union.

The abdomen was flaccid and there were no points of tenderness.

Vaginal examination showed a transverse scar about 4 cm. long, situated about two-thirds of the distance from the introitus to the vault, drawn close behind the symphysis and representing the original site of the cervix. There was no fresh exudate and no discharge.

Rectal examination revealed a moderate constriction, about four inches above the anal opening, which was undoubtedly the etiologic factor in the production of the dilated sigmoid noted at operation.

Cystoscopic and proctoscopic examination was refused by the patient at this time, with the promise, however, to submit to the same at a later date.

This patient has been under my care since her discharge from the hospital, and at this time, February 1, 1927, enjoys excellent health and is completely free from pain.

I believe that the following recapitulation will bring out the interesting points in this case.

1. The possibility of a pregnancy would seem remote because of the original extensive pelvic exudate, requiring drainage of a subsequent abscess and two later operations on the left adnexa, and the extremely high, fixed and thick cervix.
2. For several years severe pelvic pathology incapacitated the patient. From the beginning of the pregnancy her symptoms were markedly aggravated and in the later months frequent doses of morphine were necessary to control the pain.
3. Vaginal delivery was impossible because of the condition and situation of the cervix. Abdominal section was the only means available to save the life of mother and child.
4. Operation revealed: (a) the uterus completely veiled by the bladder reflection which had to be partially removed before the uterus could be incised, (b) a sacculation and distention of the posterior uterine wall, which largely accounted for the continuous uterine contractions, (c) an annular constriction, of inflammatory origin, near the junction of the sigmoid and rectum, explaining its dilatation and the previous symptoms of partial obstruction.
5. In order to relieve the previous invalidism and to safeguard against defective drainage, rupture of the uterus and peritonitis, the uterus was removed.
6. The live baby and a well mother indicate that the proper surgical procedures were used.

557 THIRD STREET.

ANNULAR DETACHMENT OF THE CERVIX IN A CASE OF PROLONGED LABOR DUE TO A GENERALLY CONTRACTED PELVIS*

BY LEE DORSETT, M.D., F.A.C.S., ST. LOUIS, MO.

WITH the exception of a scant mention in various textbooks and a few scattered case reports, the accident herein mentioned is rare. It is classified either as spontaneous amputation of the cervix, circular amputation, or transverse rupture, and as I prefer to call it annular detachment.

The factors causing this condition are a contracted pelvis and a partial dilatation of the cervix in which the whole of the cervical canal becomes fully opened up with the exception of the os externum;

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*Read before the Joint meeting of the St. Louis and Chicago Gynecological Societies held in Chicago, December 4, 1926.

the fetal head under strong contractions descends into the vagina with the wall of the cervix stretched over it. In a case of contracted pelvis the cervix becomes wedged between the fetal head and the pelvis, edema begins, followed by thrombosis and necrosis, and lastly by sloughing. As there is generally more pressure anteriorly than posteriorly, the cervix is generally attached by a small band to the posterior cervical lip.

CASE REPORT

A colored primipara, aged 20, entered the St. Louis City Hospital, having rather weak and irregular contractions. She was at full term, the McDonald measurement being 35 cm. She had a generally contracted pelvis. The fetal head was not engaged and the membranes had ruptured previous to entrance to the hospital. The fetal heart sounds were located in the right lower quadrant. For the next twenty-four hours the contractions were still very irregular, but after this time became harder. The head entered the pelvis and she was in labor some twenty four hours longer when the head was on the floor. It was then noted that there was a small bluish black mass about six cm. long and four cm. wide protruding from the vagina. This mass was unrecognized at first. Vaginal examination showed that it was attached to the posterior lip of the cervix by a band 3 cm. wide and the diagnosis was made of an annular detachment of the cervix. The fetus was delivered by a rather difficult low forceps. It was stillborn and weighed 3270 gm. and the head showed marked molding, with a large caput.

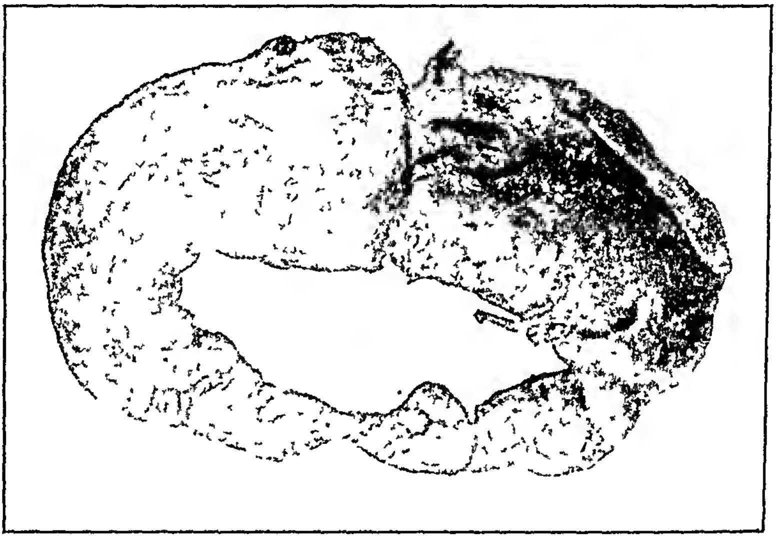

Fig. 1.—Detached cervix. The thicker portion is the posterior lip.

After the placenta was expelled the cervix was exposed, and the partially detached band of the cervix was cut away from it. There was no postpartum bleeding. There was quite an extensive laceration of the perineum which was repaired and the patient was returned to her bed in good condition.

The patient ran a low grade temperature following delivery and had a persistent urinary retention with a severe cystitis. Vaginal examination ten days after delivery revealed no evidence of any cervix whatsoever, there being only a slit about 4 cm. wide in the vaginal vault which communicated with the uterine cavity.

1217 MISSOURI BUILDING.

LONG STANDING GRANULOMA INGUINALE

By Floyd W. Rice, M.D., Des Moines, Iowa

THIS case is recorded because of its marked involvement and to add to the scant number of reported cases in the literature. The patient was very much below par mentally so the history had to be pieced together a little at a time.

Miss M. W., aged 56 years, walked into the Des Moines City Hospital (Broadlawns General) complaining of hemorrhoids, chronic diarrhea, and weakness. The hemorrhoids had been present for over two years, without soreness or bleeding, likewise a chronic watery diarrhea with incontinence of stool for nine months, which necessitated wearing a diaper, incontinence of urine for over a year without any burning or soreness. A loss of ten pounds in weight occurred since the diarrhea started. Appetite was poor. She complained of no other symptoms whatsoever. There had been no pain at any time anywhere except the slight soreness in the groins.

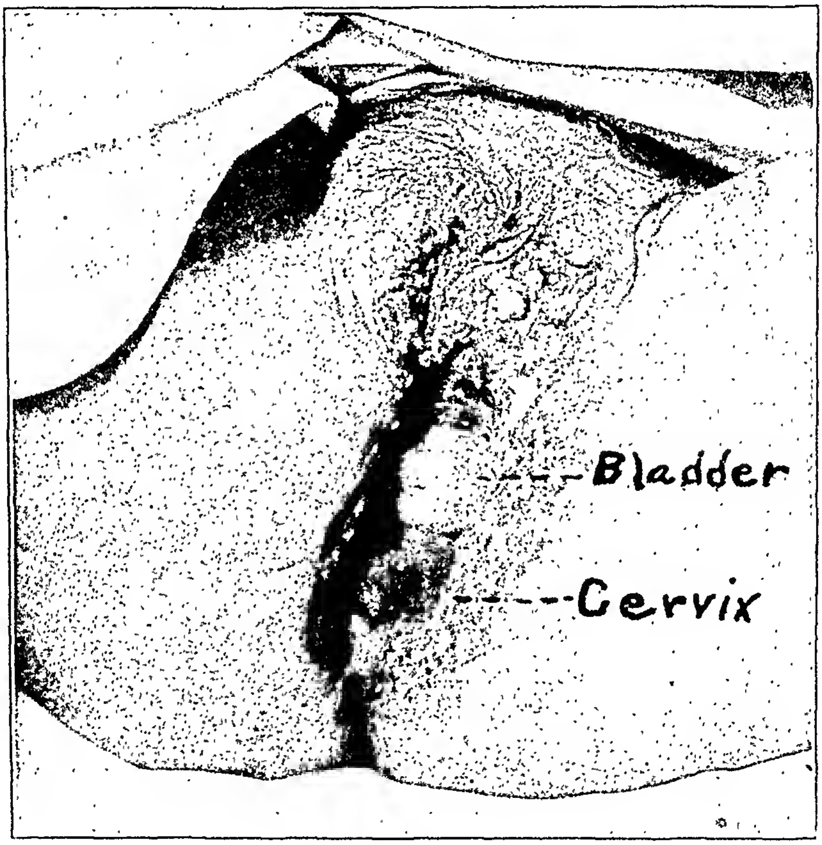

Fig. 1.

She had had the usual diseases of childhood but no other illness except a bone infection in the left shin which was operated upon several years ago. She denied venereal infection, was unmarried and never had been pregnant.

Physical Examination.—She was an elderly woman, rather pale, apparently free from pain, undernourished, and unkempt. Her right eye contained a cataract; left eye reacted to light and accommodation. No evidence of infection. False teeth. Left axillary gland size of pea, inguinal glands size of almond. Large ulcerative area with complete necrosis of all the vulvar structures, urethra, vagina, perineal body, levator muscles, triangular ligaments, coccygeus muscles and rectum with sphincter muscles up to Douglas' pouch. The walls of the ulcerated area were hard and indurated; did not bleed on touch, and were practically free from discharge. There was surprisingly little soreness.

Wassermann was negative to both alcoholic and cholesterinized antigens. Red blood cells 5,208,000. Hemoglobin 80 per cent, white blood cells 15,000 with 84 per cent polyps and 10 per cent eosinophiles. Blood sugar 0.11 per cent. Blood urea nitrogen 14 mg. The smears showed numerous Donovan bodies. The temperature ran from normal to slightly above until a few days before death when it dropped to 96° F. Owing to the absence of the urethra, urine examination was impossible. The ulcerated area was continuously bathed in urine and liquid stool.

The treatment consisted in trying as best we could under the conditions to keep the parts clean, and the intravenous administration of tartar emetic. This was started with one c.c. of a 1 per cent solution the first dose and doubled until 10 c.c. were given twice each week. At no time did she complain of any reaction to the drug. There was decided improvement beginning the second week, scab formation being noted in the periphery. We were absolutely unable to check the severe watery diarrhea. The patient became progressively weaker, the temperature dropped to 96°, and she died January 5, 1927, from exhaustion.

Autopsy Report.—(Wm. Saunders, M.D.) The liver showed bluish gray in color, not abnormal in size. Gall bladder full of gallstones. Kidneys: congenital lobulation of both; small retention cyst at upper pole of right. Pelvic organs: All atrophic; no pathology. Chest: Hypostatic congestion of lower lobe of right lung. Heart: very thin wall of right ventricle. Otherwise not abnormal. Aorta: Intima of arch shows a few superficial areas of yellowish discoloration. There was an enormous necrotic, ulcerated area involving all the external genitalia and the perineum, extending from the symphysis to the coccyx, with total destruction of the vagina and rectum up to Douglas' culdesac.

1118 EQUITABLE BUILDING.

Green-Armytage: Obstetric Teaching—A Live Method. Journal of Obstetrics and Gynaecology of the British Empire, 1924, xxxi, 218.

The author urges the use of live babies in mannekin teaching. Covering the baby with a sheet, pelvic and abdominal examination becomes a matter of live interest to the student. Version, breech, and forceps extraction are easily done on the live baby, the instrument blades being tipped with rubber. Gentleness of manipulation is required of the student from the start and is not left to be acquired later. By the aid of diagrams showing the fascial supports of the uterus the student learns the dangers of forceps application before complete cervical dilation or engagement of the head. By placing the baby in a bag, the upper end of which has been cut away, students are taught the methods of induction of premature labor. All procedures are done in a warm room, the mannekin properly warmed and lubricated, and a competent instructor is always on hand to insure careful handling of the baby.

H. W. SHUTTER.

A CASE OF FIBROMYOMA OF THE VAGINA

By C. B. Ingraham, M.D., Denver, Colo.

FIBROMATA or fibromyomata of the vagina are comparatively rare. Graves[1] states that less than two hundred have been reported, yet the possibility of their presence must be considered when a swelling appears in this region. They may be mistaken for hernia, Gärtner's duct cyst, müllerian cyst (a blind supernumerary vagina), rectocele, or malignant growth.

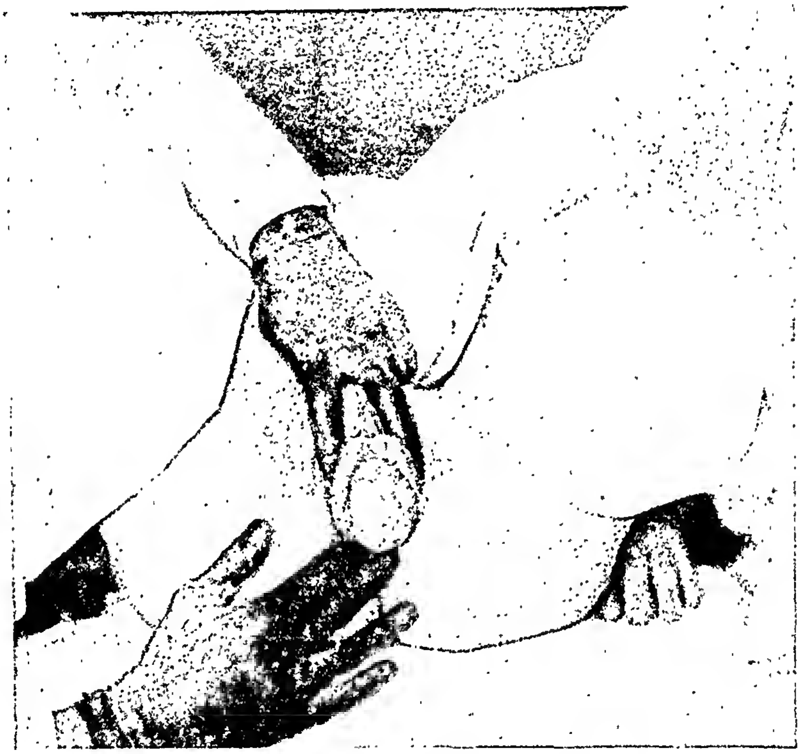

Fig. 1.—Solid tumor of vaginal anterior wall.

Fibromyomata in this situation arise from smooth muscle and connective tissue of the vaginal wall, a pure fibroma is uncommon. It may be that they are aberrant from the cervix and situated in the vesicovaginal septum or have a pedicle extending into the parametrium, in which case, there is some question whether they should be properly classed as vaginal tumors.

They are most commonly found on the posterior vaginal wall, are usually small, with a polypoid or sessile development and they are prone to undergo degeneration with sloughing and infection, occasionally becoming malignant. Littauer[2] reports an instance of serious hemorrhage from the tumor.

These growths are well defined and at operation readily shelled out. Adenomyomata, on the contrary, are intimately attached to the surrounding tissue and necessitate dissection. Adenomyoma containing glands with and without cystogenic stroma are described and supposed to arise from vaginal glands or the wolffian duct. Adenomyomata observed in the rectovaginal septum, are the type of growth described so fully by Cullen.[3] They enlarge during the menstrual period and are said by Sampson[4] to be implantation adenomata of endometrial type.

The case here reported occurred in my service at the Colorado General Hospital; a married Jewish woman thirty-nine years of age, who had had three children, no miscarriages, and normal menstrual periods with the exception that the flow has been more profuse of late.

She *had been told by a physician three years previously, that there was a* tumor in the vagina, but promptly "forgot all about this until a year later when there was discomfort accompanying intercourse." A year ago she herself found, on digital examination, a lump on the anterior part of the vaginal wall. At that time it was not large enough to protrude but during the last six months it has increased rapidly in size and has prolapsed when she has been on her feet. There has been no discomfort or symptoms other than frequency and desire to urinate.

The pelvic examination showed a moderately relaxed vaginal outlet, on the anterior wall of the vagina a soft cystic feeling tumor 6 by 7 cm. situated between the urethra and cervix. This could be replaced within the vulva and on straining, or with traction, made to protrude and resemble a cystocele. The cervix, uterus, and adnexa were normal.

At operation, the tumor was readily enucleated; running from the tumor at its upper pole, was a narrow strip of tissue about 2 mm. in diameter, which resembled the tumor in structure and went in the direction of the cervix; this was so friable that it broke a few millimeters from the growth and was lost. It gave the appearance of being a pedicle about the size of a piece of string, and as if the fibroma had originated in the cervix uteri and worked its way down into the vesicovaginal septum.

The pathologic report was made by F. E. Becker, M.D.

The section showed approximately equal amounts of smooth muscle tissue and degenerated connective tissue. The smooth muscle consists of interlacing bundles, normal in appearance, with well staining nuclei. The connective tissue fills the spaces between the interlacing bundles of muscle, was very loose, contained few nuclei and few, but quite distinct fibrils in a homogenous base.

The section grossly described as consisting of mucous membrane with a small amount of underlying tissue shows on microscopic examination, normal vaginal mucous membrane and a rather dense connective tissue layer. *Diagnosis:* fibromyoma with a myxomatoid degeneration of the connective tissue element.

REFERENCES

(1) *Graves:* Textbook of Gynecology, W. B. Saunders, 1923, p. 316. (2) *Littauer:* Centralbl. f. Gynäk., 1902, xxvi, 1406. (3) *Cullen, T. S.:* Johns Hopkins Bull., Nov., 1917. (4) *Sampson:* AM. JOUR. OBST. AND GYNEC., Nov., 1925, x, No. 5, p. 619.

509 REPUBLIC BUILDING.

REPORT OF TWO CASES OF MALIGNANT NEOPLASM OF THE OVARY. TREATMENT BY RADIATION*

By A. W. Jacobs, M.D., New York

THE majority of the malignant neoplasms of the ovary are carcinomatous and present a difficult problem in therapy. In general, results from surgical measures alone are not very encouraging. It is possible that by some combination of surgical and radiotherapeutic procedure better results may be obtained in producing palliation of symptoms and a prolongation of life.

A recent study of fifteen cases of carcinoma of the ovary which I made at the Montefiore Hospital during the ten-year period from 1914 to 1923 inclusive, showed the following: married 13, single 2; youngest 22, oldest 80. Age periods: 22 to 30, 3 cases; 31 to 50, 5 cases; 51 to 60, 6 cases; 80, 1 case; showing that about 70 per cent occurred between the ages of 31 and 70. Ascites was present in 11 cases, hydrothorax in 3 cases. The total duration varied from 5 to 42 months. Most of the patients living over twelve months and up to forty-two months were past the age of forty. The total duration in three individuals aged 58, 60, and 80 was 36, 36, and 42 months, respectively, which apparently suggests a better prognosis in the number of months in the older women. The average total duration of life during the period from 1914 to 1921 inclusive, without any special therapy, was twelve months; while the average duration in 1922 to 1923, when Roentgen therapy was instituted, was twenty-three months.

Case 1.—J. E., a woman aged 28, was referred August 24, 1925, with the following history: Married four years, one child living and well, 3 years old; no miscarriages. Menstruation started at thirteen years and was regular, and normal. After the birth of her child three years ago, she became markedly constipated for about a year, then improved until one year ago when she again became constipated and had to resort to cathartics. Commenced to lose weight in January, 1925, and lost about twenty pounds in a year. Had no pain but on account of the constipation consulted a physician, who upon examination established the presence of a pelvic tumor, which was confirmed by several physicians. The diagnosis was fibroid uterus.

Abdominal examination revealed a hard mass in the suprapubic region. On vaginal examination there was a hard irregular mass in the posterior culdesac.

At operation by Dr. Rongy at the Lebanon Hospital, in June, 1925, there were papillary masses on the anterior surface of the uterus involving the bladder wall, metastases in the glands and peritoneum, also a large hard retroperitoneal mass. The condition being considered inoperable, a specimen was taken for pathologic examination, and the wound was closed. Microscopic report was papillary adenocarcinoma of the left ovary with metastases.

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*Presented at a meeting of the Society of Alumni of Lebanon Hospital, March 8, 1927.

About six weeks after operation, the patient was referred to me for deep Roentgen therapy, which was begun August 24, 1925. She received a series of treatments to the pelvis; four fields 15 x 15 cm. each, anterior, posterior, and lateral, at 50 cm. distance, 200 K. V., 4 M. A., filtration 0.5 mm. cu. and 1 mm. Al, 30 minutes each, and repeated.

Examination of the patient by Dr. Rongy about two months after treatment was instituted showed her to be gaining in weight, appetite good, bowels functioning without the aid of cathartics, and diminution in the size of the masses in the abdomen. He advised a repetition of the series of Roentgen treatments, which was given in December, 1925.

Her last menstrual period was September 29, 1925, three days' duration, and she has had no period since. The patient has been attending to light household duties, and was without symptoms until November 5, 1926, when she appeared again for treatments, which she received only partially, as she failed to present herself for the completion of the series. A report from her physician about two weeks ago states that she is beginning to have symptoms again, which may necessitate a repetition of a series of treatment.

It is now about eighteen months since this patient was referred to me for therapy, and apparently the condition has been controlled, with palliation of the symptoms.

Case 2.—A. C., woman aged 51 years, was admitted to the Lebanon Hospital December 11, 1925, her chief complaints being abdominal pain, flatulence, and backache. She had been married twenty years, and never been pregnant. Menstruation commenced at sixteen, regular, and normal. For the past year her periods were irregular, occurring every two-and-a-half to three months, and lasting three days. Last period six weeks before admission. Medical history is negative. Operation for cervical adenitis at the age of seven. Cholecystectomy and appendectomy at the Mt. Vernon Hospital five years ago. The onset of the present illness was two weeks, with pain in the abdomen radiating to both lower quadrants and to the flanks. Relieved by standing, aggravated by sitting or lying on the left side. Constant backaches and a feeling of pressure on the rectum with passing of an abnormal amount of flatus. No bleeding or leucorrhea, but for the past year the menstrual periods have occurred at intervals of two to three months. Nocturia and dysuria for the past two weeks.

The positive findings on physical examination were: general appearance emaciated and evidence of loss in weight. The abdomen was distended by a large mass about the size of an egg-plant, located mainly on the left side of the abdomen extending beyond the midline over the right side. The mass was tender at all points, especially on the left side, soft and doughy in consistency, not fixed in position, regular in outline, and dull on percussion. On vaginal examination the mass was palpable in the left fornix. Roentgen examination of the chest was negative. Roentgen examination of the abdomen showed a mass in the pelvic region, which extended to the level of the fourth lumbar vertebra, with the shadow more prominent on the left side, with upward displacement of the intestines, suggestive of a pelvic tumor. Blood examination showed Hb 70 per cent, W. B. C. 11,200, P. 80 per cent, L. 20 per cent, B. P. 140/90. Blood Wassermann and blood chemistry were negative. Urine negative. The preoperative diagnosis was ovarian cyst.

At operation December 15, 1925, the omentum was much thickened, adherent at all points, and particularly over the bladder region. The entire pelvis was a mass of firm adhesions. The large cyst behind the symphysis was freed, being ruptured in the process and about a pint of dark serous fluid escaped. A specimen from the omentum was taken for pathologic examination and the wound closed. Pathologic report gross and microscopic was normal fatty omental tissue,—no evidence of tumor formation.

Except for slight postoperative fever, the patient had an uneventful recovery, and was discharged from the hospital January 10, 1926.

On January 30, 1926, the patient was readmitted to the Lebanon Hospital complaining of frequency of defecation and urination, pain in the lower abdomen and vomiting, beginning two days after she left the hospital. No hematuria or melena. Ten days later, began to have dull pains in the lower abdomen with feeling of pressure, which were not constant. Vomiting for three days of greenish fluid. Complains of feeling weak.

Examination revealed a semihard mass extending from the pelvis to about one and a half inches above the umbilicus, not tender. Flat on percussion. On vaginal examination, a soft mass was palpable. Diagnosis was papillary cystadenoma of the ovary.

Oophorectomy was performed by Dr. Rongy and radium implantation by me on February 11, 1926. Low median incision of the abdomen, encysted bloody fluid found, left ovary contained a papillary cystadenoma, which was removed. Bare tubes of radium emanation were inserted into the base of the stump, and adjacent peritoneal coverings, a total of twenty-nine (six to the left, fourteen to the right, and nine in the cyst wall), and three drains were inserted.

Microscopically the ovary showed cystic degeneration of papillomatous masses with diagnosis of papillary cystadenoma. In spite of the pathologic report, clinically this case was considered as a malignant neoplasm.

The postoperative course was uneventful except for a temperature reaction up to 102° for several days after the operation. The general condition improved, and the patient gained in weight and strength. On March 8, 1926, the blood examination showed Hb 68 per cent, R. B. C. 3,900,000, W. B. C. 8,000, B. P. 165/90. At this time, the patient was transferred to the New York City Cancer Institute for further treatment.

Examination on March 11, 1926, by Dr. I. Levin, revealed an irregular nodular mass fixed and immovable in the lower right quadrant of the abdomen, slightly tender. There was a shifting dullness in the flanks. On vaginal examination, a mass was palpable in the right fornix, with the left fornix only slightly involved. The patient received high-voltage Roentgen treatments to the pelvis, and was discharged from the hospital, improved, on April 24, 1926.

Examination of the patient on March 8, 1927, showed her to be in good general condition, gained in strength and weight from 119 at the time of her discharge from the New York City Cancer Institute to 155 pounds. She attends to all her duties and is symptomless. Has had no menstrual period for about fifteen months. Examination of the abdomen revealed a hard mass fixed in the lower right quadrant, not tender nor painful. It is now over a year since operation and implantation of the radium, and the patient is symptomless, with the condition apparently controlled.

CONCLUSION

In malignant neoplasms of the ovary, Roentgen therapy can produce a palliation of symptoms and a prolongation of life. Generally the surgeon and the gynecologist are pessimistic in the management of these conditions, although it is possible that by the proper cooperation with the radiotherapist better results can be obtained in the future.

40 West Seventy-Second Street.

REPORT OF A CASE OF SEPTICEMIA FOLLOWING A SACRAL ANESTHETIC*

By Lyman S. Hall, M.D., Nashville, Tenn.

(Assistant Resident in Gynecology and Obstetrics, Vanderbilt Hospital)

Mrs. D. B. was admitted to the gynecologic service at Vanderbilt University Hospital, January 26, 1927. Her general physical condition was good and she presented a relaxation of pelvic floor, prolapse of posterior vaginal wall, chronic endocervicitis (nonspecific), and retroversion of uterus.

On the third day of her hospital stay the following operative procedures were carried out: Sacral anesthesia, dilatation and curettage, cauterization of cervix, perineorrhaphy (Polak's technic), anterior suspension of uterus, (Olshausen's method).

The sacral anesthetic failed to work and general anesthesia was resorted to.

The following day the patient complained of severe pain to the left of the sacral hiatus. She had some nausea and vomiting and her temperature rose to 104° F., pulse 130 and respiration 24. On the morning of the second day her temperature was 101°, pulse 120, and respiration 22. Her condition seemed slightly improved. Late in the afternoon her temperature rose to 104°, pulse 180 and respiration 32. Her pulse was quite thready and her condition serious. To the left side of the spine from the sacral hiatus to the lower angle of the scapula was an area of marked induration and slight crepitation. This was quite tender and very painful. She continued to vomit and the emesis was now almost pure bile. On the morning of the third day her temperature was 101.5°, pulse 130, and respiration 24. She continued to vomit bile, her condition was becoming worse, and she was quite jaundiced. A gastric lavage was done and the vomiting lessened. She was also given normal saline, subcutaneously, and digifoline. The area in her back remained about the same as on the previous day. The perineal and abdominal incisions were in good shape. She was typed for a blood transfusion and early in the night was given 460 c.c. of whole blood by the direct method. The blood of the donor and recipient were both type 2 and cross-matched perfectly. The patient was better for about 30 minutes after the transfusion, and then complained of being cold and showed signs of weakening. She soon lapsed into unconsciousness and died about three hours later. Her temperature shortly before death was 108°.

On admission the urine was negative, red blood cells 3,450,000, white cells 8400, hemoglobin 63 per cent. On the second postoperative day the urine showed albumin two plus, sugar negative, and microscopic examination revealed both red and white blood cells. White blood cells were 17,000, and hemoglobin 61 per cent. On third postoperative day red blood cells 3,208,000, white cells 16,200. A blood culture obtained on the third day revealed numerous colonies with definite zones of hemolysis, and when stained revealed a large gram-positive bacillus. A culture from the abdominal incision was sterile. The organisms when injected into the ear vein of a rabbit had no effect. When the rabbit was killed and incubated a slight amount of gas was formed in the tissues. The organism when injected intramuscularly in the inguinal region of a guinea pig killed it, and produced a slight amount of gas in the tissues. The bacteriologic laboratory reported a large nonmotile, nonproteolytic, anaerobic bacillus, probably related to Bacillus oedematiens.

The partial postmortem examination of the abdomen showed no infection in the incision. The liver showed numerous areas of bile staining on the surface. The peritoneum, intestines, stomach, gall bladder, pancreas, spleen, kidneys, and uterus were all entirely negative. We were not permitted to open the area in the back. Cultures from incision and the liver blood were contaminated by bacillus subtilis.

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*From Department of Obstetrics and Gynecology, Vanderbilt University.

Comment.—At the time of injecting the novocaine I believed the needle was in the sacral canal. Since the anesthetic failed and the patient complained of pain in her back so early following, I believe the novocaine was injected in the tissue to the left of the sacral hiatus. The patient was obese and the sacral administration quite difficult. The marked jaundice, nausea and vomiting, and extreme shock which followed show that the organism was a very virulent one. DaCosta in his *Textbook on Surgery* says that blood transfusions in acute septicemia are more often associated with reactions. In this case the blood transfusion might have hastened death a few hours. But the infection was one of such virulent nature, the jaundice so marked, and the patient's condition so grave, that nothing would have saved her life.

Some of the members of our hospital staff took the stand that a septicemia could not arise by any form of a gas bacillus being injected into the tissues. Since I have seen a case of gangrene following a circumcision under novocaine, and another case of gangrene following an operation for an ingrowing toenail under novocaine (in which the hallucis longus tendon sloughed and drop of the great toe followed), I believe the devitalization of the tissue caused by the novocaine associated with the organisms present made an ideal site for infection, not unlike the ones sustained during the world war with the bacillus of Welch or true gas bacillus.

It has been proved that some forms of gas bacilli live normally in the intestinal tract of about one-half of all infants before they are one year of age and in the intestinal tract of the majority of adults. I believe that this organism was present on the patient's skin and was carried in by the needle used in the administration of the sacral anesthetic.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D.

ABSTRACTS OF THE PROCEEDINGS OF THE FOURTH ANNUAL CONFERENCE OF THE STATE DIRECTORS OF THE ADMINISTRATION OF THE SHEPPARD-TOWNER ACT, HELD IN WASHINGTON, D. C., JANUARY 11-14, 1927

DeNormandie, Robert L., M.D.: **Maternal Mortality Studies.**

The schedule for this study was prepared in accordance with methods outlined in a previous paper by the author, entitled "How to Make a Study of Maternal Mortality." The first page of the schedule gives information derived from the birth and death certificates. The second page tabulates the care received during pregnancy, parturition and the puerperium. Pages three and four are taken up with the causes of death as found in the death certificate and a classification according to the International Classification. This standard schedule can be used for studies of maternal mortality to be conducted by State Boards of Health, Medical Societies and those trained in investigation and obstetrics. A study of this kind should bring out facts which would be comparable for different sections and countries and might serve as a basis for accurate knowledge on which possible improvement in obstetric practice could be based. The results of prenatal, natal and postnatal care could be analyzed. The results of home and institutional care could be compared. The results in different environmental conditions could be studied.

Crough, Elena M.: **Foundation for Permanent Child Hygiene Program in New Hampshire.**

A sort of correspondence course for mothers and prospective mothers was carried on. Mature and experienced public health nurses were carefully selected and employed. The first step was to visit and secure the cooperation and help of local physicians. Attempts were made to get prenatal cases under the care of a physician as early as possible. Employment of local physicians in the clinics, the formation of permanent committees in the towns and villages, and obtaining permanent local appropriations and the utilization of county maternity and infancy nurses to carry out the general and detailed programs are the essentials of the work in New Hampshire.

Ferrell, John A., M.D., Dr.P.H.: **The County Health Organization in Relation to Maternity and Infancy Work and in Permanency.**

Local health service is essential in every state. It should be conducted in small territorial units, as the county. The goal should be an official service that is adequate, continuous, and permanent, supported by taxes and conducted by full time workers. Specialized training is not possible for those working in the smaller centers. Health officers and workers should be well trained. Thoroughness and persistence are necessary, especially in dealing with maternity and infancy welfare measures.

FOX, ELIZABETH: Standards for Training of Public Health Nurses.

The excess of demand over supply of properly trained public health nurses, especially of those capable of maternity and infancy work, necessitates either filling the places with improperly equipped nurses or not meeting the demand at all. Standards have been formulated by committees of the State and Provincial Health Authorities, American Public Health Association, and the National Organization for Public Health Nursing. The nurses should be expected (1) to bring about in the community a higher valuation of human life and of the need for adequate prenatal, maternity and infant care; (2) to supply the knowledge which will lead to better prenatal hygiene and care of the infant; (3) to help produce the facilities which will make good prenatal and child care possible. This requires the proper viewpoint as well as special training and experience in addition to personality and character.

KUHLMAN, MATHILDE S., R.N.: Methods of Training Staff Nurses in Prenatal and Infant Care.

The training of staff nurses in prenatal and infant care in the State of New York has been more or less in process of evolution since 1922. The Public Health Council requires these nurses to be registered by the Regents of the University of the State of New York and to have had not less than two years' experience in public health nursing. An effort was made to secure nurses who had hospital training and postgraduate work in obstetrics and pediatrics. Each nurse coming on duty is required to spend a period for observation and instruction at the Maternity Center Association. A definite teaching center for these nurses came to be a necessity. Such a one has been established in Fulton, Oswego County. The Fulton Academy of Medicine voted unanimously for the establishment of a demonstration mother and child health station and appointed a medical advisory committee to cooperate with the nurse detailed to the work. The present facilities for training staff nurses include: Fulton Teaching Center, Children's Consultation Unit, Prenatal Consultation Units, Staff conferences with consultant nurses and directors, visits to Maternity Center Association, Field Center and other New York City organizations, and an annual conference of all health officers and public health nurses which is called by the State Commissioner of Health.

VEECH, ANNIE S., M.D.: Obstetric and Pediatric Postgraduate Courses in Kentucky.

For the past four and one-half years the Kentucky Bureau has made an unceasing effort to bring to the medical profession of the State the best information available concerning modern obstetrics and pediatrics. The methods used have included monthly articles on obstetrics in the State medical journal; reports on the handling of difficult cases of delivery in the Louisville City Hospital; cooperation with the medical department of the University of Louisville; an annual program incorporated into the yearly meeting of the State Medical Association; speakers loaned to the county medical societies; and demonstration health centers throughout the state. A special postgraduate course was given by Dr. Alice Webb Fallant during the past year before ten county and two district medical societies. This work had the approval and sponsorship of the State Board of Health and Medical Association.

Allen, Jane C.: **Supervision of Field Nurses.**

Maternity and infancy work is frequently carried to the lonelier rural sections where such care would otherwise be negligible or lacking. The increasing importance of the work to public health nurses and to the community is being shown in various ways by meetings, in current literature, and educational institutions. There is a growing conviction that proper supervision is the very hub of the whole wheel. Supervision entails certain obstacles and must accomplish certain ends. 1. The nurse is apt to resent it; the supervision must be tactful; it must secure cooperation. 2. It must be effective, requiring a complete grasp of details without obtrusiveness. 3. It must bring the small units up to the same standard and coordinate with the work of larger units. 4. It must be educational.

Allen, Cora S., M.D.: **Itinerant Conferences as an Advance Agent in Developing Permanent Centers.**

In Wisconsin the greatest need for a public health program has been in the rural communities. After the first year's work sixteen counties were chosen for monthly conferences and demonstration clinics. This led to a demand for permanent centers which increased from one to fifteen within a year. A big factor in the success of the permanent center is the trained public health nurse. The concensus of opinion is that one of the most effective ways of reaching an entire family is through a permanent center where results of right methods can be seen in the steady normal growth of children who attend regularly.

Lobenstine, Ralph W., M.D.: **The Tioga County (New York) Demonstration in Prenatal Care.**

The problem of providing expectant mothers in small towns and in rural communities with reasonable safeguards during pregnancy and labor is one that is surrounded, on the whole, with more difficulties than are encountered in urban communities. Some years ago a demonstration was undertaken in Tioga County, N. Y., to adapt the methods of the Maternity Center Association to rural communities. The State Health Department agreed to furnish the funds necessary to carry on a maternity nursing service by nurses from the Maternity Center Staff. Prenatal clinics were opened the last week of January in 1925 after enlisting the sympathy and interest of the county medical profession. By the latter part of the year, four nurses were working in the demonstration. By the end of the first year 247, or more than half of the pregnant women of the county had been under the nurses' care; 63 per cent of these women were referred by physicians. The nurses made 3020 home visits and attended 58 deliveries. In 1926 there were 253 new patients, of whom about 53 per cent were referred by physicians. During this year the nurses attended 111 deliveries. In 1926 the nurses made 3,293 home visits. There were no maternal deaths among the cases cared for by the nurses during either year.

Hanna, Agnes K.: **Analyses of Child Care Teaching and Little Mothers' Classes.**

Group teaching is an important aspect of a state maternity and infancy program. A definite policy in regard to such work should be developed in each state. *Effective* group teaching cannot be carried out sporadically, but must be a definite part of the permanent program of the community. It has been realized that the "little mothers'" classes which began as an extra school or settlement activity belong in the schools where the instruction can be given by teachers. Wisconsin is the only state that has a complete state-wide plan for teaching child care as part of its regular curriculum. The "little mothers" and mothers may also be reached through self directing study groups. It is possible to reach them by lectures and through class work. The State Department of Health can be of service by preparing study outlines and material and by securing lecturers and teachers for the various types of mothers' classes.

BRYDON, MARY E., M.D.: **Developing Permanent Health Centers.**

The modern public-health movement has three objectives: curative medicine, preventive medicine, and constructive health education. The practicing physician, surgeon, or specialist alone is concerned with handling the first. Health departments have initiated the second and third, but are urging that the physician take them over as a part of his work and that health education be made a part of the educational system. During the past twelve years the health center, the home of the local health department, has become an institution in public health work. In Virginia the health centers are varied both as to the types of organization and as to the nature of their activities. The larger cities, like Richmond and Norfolk, have health centers with a central office, in charge of a medical director who supervises the activities of small centers and stations. Maternity and infancy work is usually included in their programs. They always attempt to cooperate closely with all social welfare agencies. Ten cities in Virginia have health centers. The county health work is carried on through health centers and health stations, the latter being instruction and conference centers for mothers and children in charge of nurses. The state has five counties with a well-organized health center in each, and ten counties with a total of 37 health stations.

BAKER, S. JOSEPHINE, M.D.: **Preliminary Report of Possible Cost-Accounting System on Separate Items of Work Carried on under the Maternity and Infancy Act.**

A proper cost-accounting system on the separate items of work carried on under the maternity and infancy act must consider the conditions of work, the relative importance of the various items, the general methods of carrying on the work, and the most efficient administrative methods. Forty replies were received to letters and questionnaires sent out to all the State Directors. The rural problem was common to almost all the states. Different sections of the country have other general problems: the Southwestern States have a migratory population; the Northeastern States, a large alien population; the Southeastern States, the untrained midwives and the high death rate among the negroes; and the Northwestern States, a scattered population. The particular needs of the individual States were indicated by the most important activity. In nine it was general health education; in eight, prenatal instruction and care; in seven, cooperative work between the states and counties; in five, "little mothers' classes"; in three, supervision of midwives; in three, prevention of infant mortality; in three, lectures on obstetrics before medical societies and in medical colleges; and in one, preschool child work. The expenditures fall into two groups: First, those for intensive work in the immediate saving of lives; second, those for general public-health education. A method which may combine the intensive with the general educational method is that which results in the counties carrying on their own work. The state pays half and the county half of the cost. In nearly every state where this method has been tried there has been better cooperation on the part of the local medical profession. The information gained shows a complex problem, the solution of which must meet the local needs. No standardized methods would be equally effective in all. Each state must evolve its own methods and cost-accounting system.

Hall, Carrie M., R.N.: **Training the Obstetric Nurse.**

Every state now has a nurse-practice act and many states have minimum standards of instruction and practice. One of the required subjects is obstetric nursing. Obstetric nursing practice is easily obtainable, but in general undergraduate nurses receive no prenatal instruction. This instruction can be obtained after graduation, through maternity centers and the maternity services in visiting-nurse associations. A four-month course in public health nursing has also been found helpful in giving an insight into the teaching of prenatal care. Nurses are occasionally called upon to deliver a patient and nurses feel that some training in the delivery of normal cases would be desirable. This problem is being studied by a joint committee from the National Organization for Public Health Nursing and the National League of Nursing Education.

Richardson, Frank Howard, M.D.: **Breast-feeding Demonstrations.**

Breast feeding should be presented not as a public-health measure, but as a private practitioner's method for feeding babies under his care. A breast-fed baby has five chances for life to the bottle-fed baby's one chance. Two essentials in breast feeding are (1) complete emptying of the breasts and (2) making up for any deficiency by giving a complementary feeding. If the baby does not empty the breast, this must be done by manual expression. Premature weaning is unnecessary, but is due to various causes. Binding the breasts and giving castor oil the first few days after confinement reduces the milk supply. Other causes are fissured nipples, nervousness, and lack of sleep. The nursing mother should eat as she pleases, take a quart of milk daily, some fresh cream, green vegetables, brown bread, and cod liver oil if necessary. Babies should not be fed in the horizontal position as the esophagus then lies below the food level and the air cannot escape. Four-hour feeding intervals are to be preferred. Milk analysis is of no value unless at least three specimens from each nursing of a twenty-four hour period are used. The only serious thing ever likely to be wrong with milk is its quantity.

Marriner, Jesse L., R.N.: **Evaluation of Maternity and Infancy Work in a Generalized Program.**

The work of a committee to evaluate activities which may be accounted as maternity and infancy work included a survey of the situation in 26 states where Sheppard-Towner funds were being used to subsidize such activities. In answer to a questionnaire which twenty-two states answered it was stated by all that the funds were used to subsidize and maintain local or county activities in the public health nursing field. In nineteen states this was part of a generalized nursing program and in three it was a specialized maternity and infancy service. Eleven of twenty-one states had no contracts with county health organizations. In Alabama the time distribution and methods of supervision have been worked out as follows: A forty-four hour week is taken as a basis. A supervising nurse visits each organized county every month, studies and tabulates the activities as shown on the daily visit cards of each county nurse. The percentage of time given to each activity is worked out. This system has been on trial for only a few months, but a marked effect is already seen in more complete, accurate and intelligible daily records of the nursing work.

MOSHER, GEORGE CLARK, M.D.: The Problem of Compulsory Notification of Puerperal Septicemia.

Current American literature contains practically no expression of opinion in regard to compulsory notification of puerperal septicemia. No conclusive report on the working of the law was elicited by inquiry sent to boards of health in the states requiring notification. Questionnaires sent to officers of national medical and other interested organizations and a number of leading obstetricians and teachers in medical schools brought replies stating more or less definite opinions and furnishing information in regard to the situation. The gist of 16 replies from obstetricians, of 5 from state executives, and of one from a city executive is given. The opinions for and against compulsory notification and the exacting of a penalty are almost evenly divided, so far as definitely expressed. It is concluded that if notification is to be required the wording of the law should be considered with regard to the varied conditions that may cause pyrexia.

The two main weapons for reducing the mortality due to puerperal septicemia are:

1. Education. The obstetricians who now are in the schools and hospitals must be taught the fundamental principles of asepsis; and prospective mothers must learn to demand good care. When women realize that childbearing can be made safer, a powerful public sentiment will be aroused that can be utilized in reducing puerperal mortality.

2. Publicity. This affects the general practitioners now doing obstetric work and treating all sorts of suppurating wounds, erysipelas, and other virulent infections and rushing from the patient with temperature to the clean maternity patient and seldom changing their clothes or using sterile gloves in the delivery. Publicity furnishes the only means of impressing upon these men that a woman dying from puerperal septicemia after such needless exposure is doubtless a victim of carelessness or ignorance. It is not to be argued that compulsory notification will in itself achieve anything marvelous, and a punitive clause may not aid greatly; nevertheless the publicity coming from notification would make the physician who now scorns the extra precautions urged for the lying-in patient realize that to continue work in his community he must change his tactics even if no other penalty is to follow.

Every available means must be used to reduce puerperal sepsis whether or no we resolve that it should be made reportable. We must urge the medical schools to give due place in the curriculum to prenatal care, to management of normal labor, and especially to asepsis. We should institute a further campaign of education through state boards of health, state and county medical societies, health centers, and lay organizations having as its aim better maternity conditions.

Society Transactions

OBSTETRICAL SOCIETY OF PHILADELPHIA

STATED MEETING NOVEMBER 4, 1926

DR. JOHN M. LAFERTY described the **Postmortem Findings in Two Neonatal Deaths, Showing Congenital Absence of Both Kidneys; Dextrocardia and Fatty Degeneration of Liver.**

CASE 1.—Mother, white, aged 29, para v. The four previous labors and puerperia, were normal. The first three children are living and well. The fourth baby appeared normal at birth, but a few hours afterward it became cyanosed and died in about 36 hours. This death was reported as due to subdural hemorrhage. During the present pregnancy the patient had a mild toxemia according to St. Mary's standard and a slight cold during the fourth month. Her general condition was good, weight 154 pounds. Urine showed marked trace of albumin and sugar. No casts or other abnormal findings.

Delivery was spontaneous, second stage rather precipitate, about fifteen minutes in duration. Total time of labor three hours. Placenta delivered spontaneously within one-half hour. It appeared normal macroscopically. Baby cried vigorously and spontaneously after delivery and had a good color. About eight hours afterward it was noticed to be slightly cyanosed. The respirations became gradually more rapid and shallow and cyanosis deepened until baby died forty-eight hours after birth. A clinical diagnosis was made of dextrocardia with either (a) some other vascular anomaly or (b) a subdural hemorrhage, the result of the precipitate labor.

Postmortem Examination.—Weight 7 pounds 4 ounces, length, 49 cm. No external deformities. Skin and mucous membranes markedly cyanosed. Brain and meninges normal. Pericardium attached to right side of diaphragm, apex of heart on right side, great vessels normal, heart valves normal, foramen ovale and ductus arteriosus closed. Lungs had numerous small atelectatic areas scattered throughout, particularly numerous in right lower lobe. Microscopic examination showed a diffuse fatty degeneration.

Remarks.—The condition of the liver would indicate that death was the result of a toxemia. The origin of a toxin having such destructive effects on the liver is obscure. Three facts would tend to suggest a maternal origin. (1) The absence of any marked changes in the other organs. (2) The death of a previous baby with similar symptoms. (3) The presence of a toxemia, mild stage, in the mother.

CASE 2.—Mother white, aged 44, para, xi. Her ten previous labors, with the exception of one unnecessary forceps delivery, were spontaneous and normal. Puerperia were all normal. Nine of her children are living and well. One died of pneumonia at seven months. During her last pregnancy she had frequent attacks of nausea and vomiting, was somnolent, and dyspneic on exertion. No acute illness or injury.

Physical Examination.—Weight 157½ pounds. Tonsils normal.

The urine showed a trace of albumin, and positive reaction for acetone. No casts or other abnormal findings.

Labor normal and spontaneous, about ten hours. Membranes were ruptured artificially when head was at vulva. Only a small quantity of amniotic fluid escaped. Placenta was delivered normally within one-half hour. It was small and numerous infarcts were present. Microscopic examination showed chronic placentitis. Baby was cyanosed when delivered and breathed only after respirations had been started artificially by Schultze method. The respirations were gasping and slow, about six per minute. Artificial respiration was resorted to several times when breathing ceased. Heart stopped beating one-half hour after delivery.

Postmortem Examination.—Weight 6½ pounds. Length 48.5 cm. No external deformities. Brain and meninges normal, as well as internal viscera. Gall bladder was only a rudimentary cord. Bile duct patulous. The adrenals were both larger than normal, but no trace of either kidney. Both ureters were also absent as were the renal vessels. The urinary bladder was rudimentary with thick walls and having a capacity of only 1 c.c. Urethra was patulous. Umbilical vessels were normal. There was cryptorchidism on right side and tunica vaginalis was distended with clear serous fluid. Left testicle was normal.

DR. J. STUART LAWRANCE and DR. WILLIAM F. MOORE presented a paper entitled **Management of Pulmonary Edema of Eclampsia by Permanent Bronchoscopic Operation.** (See page 55, July issue.)

DR. LEWIS C. SCHEFFEY read a paper entitled **The Value of the Sugar Test in the Diagnosis of Pregnancy.** (See page 202.)

DISCUSSION

DR. JOHN COOKE HIRST, 2ND., said he had used the sugar test in nearly 300 patients, of which 180 were reported in his two papers. He never used the stated dosage of 120 gm. of sugar, but varied the dose according to the size of the patient, amounting to about 90 gm. for a patient of 120 pounds, and being never over 150 gm., in any case. Dr. Hirst regarded the dosage as very important and the results in his second paper showed an accuracy of 87 per cent, on pregnant and nonpregnant patients combined. At the University Maternity, the test was regarded as valuable for the diagnosis of a dead ovum, and was invariably used before cleaning out the uterus in any doubtful miscarriage. Dr. Scheffey's patients received considerably more sugar and perhaps that explained his high percentage of failure with false positive results.

DR. JOHN LAFERTY said that one significant factor was the blood sugar in toxemia of pregnancy, because women suffering from toxemia have a marked tolerance for glucose and in his experience as high as 50 gm. every three hours had been administered in severe cases without having any glucose eliminated in the urine at all.

DR. LEWIS C. SHEFFEY said that he may have read Dr. Hirst's article incorrectly; but he was quite sure that in his first paper he began with 100 gm. of sugar, later using 125 gm. His second paper, in which he described the use of 7.5 gm. for every 10 pounds of body weight, appeared six months after Dr. Scheffey had begun his studies in which 120 gm. were used. In view of Dr. Hirst's criticism that he used too much sugar, and thereby secured too high a percentage of positives in nonpregnant cases, it would seem that by the same reasoning he should have secured a higher percentage of positives in those definitely pregnant. This was well brought out in two of the ectopic cases, when we were especially anxious about the diagnosis. Of course, Dr. Hirst reported a larger series of cases, but Dr. Scheffey felt that his number was sufficient to show the unreliability of the test.

Dr. James L. Richards read a paper entitled **The Present-Day Indications for Treatment of Myoma Uteri.**

In this he reviewed a series of 140 consecutive cases of myoma from the gynecologic ward service of the Jefferson Hospital from October, 1921, to December 31, 1925.

Nine patients received no treatment for the following respective reasons: one had a symptomless myoma and relaxed pelvic floor. Perineorrhaphy was performed, no treatment was given the myoma. Two had myoma complicating pregnancy. One had paresis. One had cardiorenal disease and symptomless myoma. Four refused treatment.

Supravaginal hysteromyomectomy was the plan of treatment employed in 88 cases, abdominal myomectomy in 11 and vaginal myomectomy in 2. Concomitant adnexal disease required removal of both ovaries in 51 cases. One ovary was conserved in 29 cases and both were conserved in 8 cases. Two patients received radium treatment before operation and 27 were treated by radiation only. Five of the series had blood transfusion prior to operation, and two were transfused before irradiation. Eighteen, or 17.9 per cent of the 101 patients treated surgically had postoperative complications. Five developed bronchitis; two bronchopneumonia, and one lobar pneumonia. One had atelectasis, one pyelitis, two cystitis, two phlebitis, and two wound infections. One patient had a stormy convalescence, sputum and blood cultures negative, one a recurrence of an old tuberculous process.

Regarding operative mortality, three patients died of peritonitis giving an operative mortality of 2.97 per cent and a primary surgical cure of 97.03 per cent. There was no radium mortality; 62 of the surgical cases and 24 of the radium cases were examined in the dispensary subsequent to treatment or replied to questionnaires. Sixty of the surgical cases examined were cured anatomically and symptomatically, giving a late operative cure of 96.7 per cent. One patient had a mass in the left adnexal region and one developed carcinoma of the cervical stump, one year after operation, giving poor late results of 3.22 per cent. Forty, or 39.6 per cent were not heard from. Of the 24 radium treated patients who were examined or heard from in answer to questionnaires, 21 are symptom free, a late radium cure of 87.5 per cent. Three report return of bleeding, a poor late radium result of 12.5 per cent. Three were not heard from.

It is interesting to note the effect of adnexal treatment on subsequent menstruation, based on reports 8 months to 4½ years after treatment. Of 10 surgical cases in which ovarian tissue was conserved, 5, or 50 per cent report normal or nearly normal menstruation. Two of these patients had abdominal myomectomy and three had supravaginal hysteromyomectomy. Of 19 radium treated patients, 3, or 15.7 per cent report normal or nearly normal menstrual periods.

DR. STEPHEN E. TRACY believed that fibromyomas of the uterus seldom if ever underwent malignant changes, but in a certain percentage of cases are accompanied by malignancy of the uterus. In his experience the morbidity in myomectomy was not greater than in hysterectomy. On the contrary, it has been less. Panhysterectomy is a more serious operation and is attended with a higher mortality than is supravaginal hysterectomy. The increase in mortality from panhysterectomy over the supravaginal operation is greater than the percentage of subsequent malignant degenerations of the retained cervix. If a cervix is badly lacerated or degenerated, a panhysterectomy should undoubtedly be performed. It is a very simple matter to destroy with the cautery the secreting portion of a normal cervix after the body of the uterus has been removed. The selection of the proper cases for the use of radium is a question of diagnosis.

DR. GEORGE M. BOYD asked in what proportion of the cases which were treated by radium and were found symptom free, was the tumor materially reduced in size? In his experience, this agent acted well in checking hemorrhage but in many cases had not materially reduced the size of the tumor so that the patient still has the tumor which may later on produce symptoms. He believed the use of radium will always be restricted because of the difficulties encountered in making a diagnosis.

DR. BROOKE M. ANSPACH considered that one of the most important things in Dr. Richards' paper was what he said about a preliminary curettage before using radium or deciding on the type of operation. Although mistakes will be made one can form a very reliable opinion from the gross appearance of scrapings. If the operation is preceded by curettage the operator may usually be sure whether or not there is a carcinoma which complicates the myoma. If there is a reasonable doubt the operation may be postponed until a microscopic examination of the scrapings is made. If a routine practice is made of cauterizing every cervix for the purpose of destroying, either an infection or an incipient malignant process, there will be a certain addition to the postoperative morbidity of supravaginal hysteromyomectomy, because of the sloughing cervices. Preliminary curettage reveals a cancer before the operation is begun: it is better to know then, for the supravaginal plan of removal may be abandoned at once in favor of a complete hysterectomy. When carcinoma is found only after the supravaginal removal of the uterus then the operator must remove the remaining portion of the uterus (cervix) at the risk of both infection and implantation of carcinomatous particles.

DR. RICHARDS (closing) said in answering Dr. Boyd that the patients who returned for examination all showed reduction of the size of the growth. Dr. Longaker asked the question about the menopausal symptoms in the symptom-free radium treated patients. These patients have menopausal symptoms, but judging from the replies received in answer to the questionnaires these symptoms, especially of the nervous system are not as marked as in the patients who received surgical treatment. It might be reasonable to suppose that the difference of the intensity of the menopausal symptoms is due to the fact that the action of the radium is two-fold in producing limited bleeding; its direct action on the endometrium and its indirect action on the ovary by atrophy of the primordial follicles. The patients in whom menopausal symptoms are less marked probably escape the indirect action of the radium on the ovaries.

DR. ALFRED HEINEBERG read a paper entitled **The Use of Radium in the Treatment of Certain Varieties of Endometrioma of the Rectovaginal Septum.** (See page 235.)

DISCUSSION

DR. BROOKE M. ANSPACH said that endometrioma of the rectovaginal septum is often very difficult to remove by operation and a careful report, such as Dr. Heineberg has made, showing the success which may attend the use of radium in some forms, adds much to our therapeutic resources. Endometriomas are rather common and especially since Sampson called our attention to them they are recognized much more frequently. Up to that time their significance was not altogether appreciated. A large factor in the successful treatment of endometriomata is the complete removal of ovarian tissue (castration). After the ovarian secretion is eliminated these new formations undergo atrophy. Dr. Anspach had several patients a year or two after operation, in whom good sized implantations were left in the wall of the sigmoid; these have given no symptoms and are not detectable by any methods of examination. Without any reasonable doubt they have regressed.

Dr. Graves, of Boston, at a meeting of the American Gynecological Society two years ago reported a case of what was taken to be an inoperable carcinoma of the rectum or sigmoid that had been cured by a hysteromyomectomy and removal of both ovaries; the tumor proved to be an endometrioma. If it is true that the removal of the ovaries will cure endometriomata of the rectovaginal septum, the operative resection of these growths which has a considerable mortality will not often be selected as the preferred method of treatment, and furthermore, if some of them can be treated with radium without oophorectomy it will, of course, be of the greatest advantage to the patient.

Irradiation therapy was then advised and an eight hundred milligram hour dose was applied.

A microscopic examination of some of the tissue revealed the tumor to be of the true müllerian type. Six months following operation the patient returned to the hospital complaining of severe bleeding. Biopsy again disclosed the tumor to be of the adenomyomatous variety. The patient was given a fifteen hundred milligram hour dose of radium and is now reported well.

DR. P. BROOKE BLAND reported three cases of vaginal adenomyoma, now designated by Sampson and others as endometriosis or endometriomata. The first case of this relatively uncommon type of neoplastic disease was a woman thirty-five years of age, the mother of four children. A clinical diagnosis of primary carcinoma of the vagina was made. The tumor, filling the posterior vaginal fornix, only after considerable difficulty was removed, but the patient remained well.

The second patient, a married woman, thirty-seven years of age and childless, presented a firm but nonfriable tumor filling the posterior vaginal fornix. Manipulation of the neoplasm provoked, as it did in all three of the cases, very free bleeding. A tentative diagnosis of primary carcinoma of the vagina was made. An attempt to remove the tumor by operation was not wholly successful.

The third patient was single and thirty-four years of age.

For three months previous to admission she had suffered with continuous vaginal bleeding, at times moderate, at other times severe, but of sufficient constancy and intensity as to cause a marked secondary anemia. A clinical diagnosis of primary carcinoma of the vagina had been made by the family doctor and likewise by the brother of the patient, also a physician. In this patient the typical firm, nonfriable, painless, mass was found filling the posterior vaginal fornix. A biopsy was performed and the true endometrial nature of the tumor disclosed. A fifteen hundred milligram hour dose of radium was applied and the patient is now reported well.

DR. HEINEBERG (*closing*) said it was gratifying to find others who had similar experiences in the treatment of adenomyoma of the rectovaginal septum, because eight years ago he presented a case of adenomyoma before this society and there was no member who had seen a case or was able to offer anything in the way of discussion. Dr. Bland's reports of his patients add much to the value of the use of radium in the type of case which appears to be malignant and to be so far advanced that, in the majority of instances, it cannot be removed by operation and which responds almost miraculously to the application of radium.

The Readers' Forum

CONDUCTED BY JOHN OSBORN POLAK, M.D.

The Value of the Sedimentation Test

Would you kindly discuss for me, in the "Readers' Forum," the value of sedimentation time in infections?

Very truly yours,

W. K. R., M.D.

The sedimentation time is that interval required for the setting out of the erythrocytes from a column of citrated blood in a standard calibrated tube. The normal time is above 120 minutes. The sedimentation time is of value in determining the presence or absence of infection. A rapid reading indicates the presence of infection either as localized accumulations or minute foci scattered throughout, occurring in any organ.

It has been used extensively in gynecology in determining the presence of complicating infections of benign tumor growths, and as an index of the severity of the process. It also aids to determine the best time to do elective procedures since frequently infection is present in spite of normal leucocyte count and a normal temperature. In such cases the sedimentation time is the only means of diagnosing coexisting infection.

Tuboovarian disease and pelvic inflammatory disease, occasionally become activated as indicated by recurrence of symptoms. The usual operations should be postponed until the sedimentation time is 90 minutes or over, in order to prevent stormy convalescence, added complications and a slower return to normal health. A reading of 30 minutes or under shows the presence of accumulated pus and conservative evacuation must be attempted.

The test has a definite place in the differential diagnosis of ectopic pregnancy and acute exacerbation of a chronic pelvic inflammatory process. A rapid reading would point towards infection; while the slow reading would be suggestive of ectopic.

The readings during pregnancy after the second month and in the puerperium must be excluded as the lowered reading cannot be explained on infections basis. Likewise the readings for one week postoperative show changes which are apparently due to wound absorptions and tissue trauma; however, a continued low reading after the first week indicates the beginning of complications, such as, wound infection, peritonitis, perimetritis, and pelvic exudate.

Therefore, we may conclude from the results of many investigators that the sedimentation time has a definite diagnostic and prognostic value: First, a rapid reading means infection, a slow reading eliminates this possibility; secondly, it shows the existence of infection when the temperature and leucocyte count are normal, and thirdly, it may be of value in postponing elective operations in the presence of infection which might be activated by the trauma incident to pelvic surgery.

Several papers on this topic have appeared in recent issues of this Journal, see page 220 of this issue.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Sterility and Sterilization

Mayer, A.: Sterility and Constitution. Monatsschrift für Geburtshilfe und Gynäkologie, 1926, lxxv, 21.

Constitutional anomalies especially hypoplasia and infantilism of the genitalia are more often the cause of sterility than we formerly believed. They relegate gonorrhea as a cause of sterility to the background. In the presence of infantilism, there is interference with the wandering of the sperm. A small external os may not be the cause of sterility but when it is associated with a stasis of the cervical mucus and a change in the hydrodynamics, sperm may find it difficult to enter the cervical canal. Tortuosity of hypoplastic fallopian tubes can prevent the transportation of ova as evidenced by the frequency of tubal pregnancies in cases of infantile tubes. Failure of the external os to dip into the seminal pool in cases of retroflexion also plays a rôle. The psychosexual constitution is likewise important.

There are, furthermore, biologic factors which affect the vaginal secretion. The endocrine glands, especially the thyroid, are important in sterility.

J. P. GREENHILL.

Vignes, Henry: Concerning Certain Cases of Sterility and of Prenatal Death. Presse Médicale, Paris, May 24, 1924, p. 460.

Careful investigations have shown that in some animals intrauterine death is physiologic. Vignes therefrom concludes that at least some cases of intrauterine death in the human may be explained on the same basis. Some cases of human sterility or of intrauterine death furthermore may be analogous to the results of attempts at crossing two individual lower animals of different species, reasoning that biologically the two human individuals might be as far apart as the two lower animals.

E. L. KING.

Hunner, Guy L. and Wharton, L. R.: Sterility. A Study Based on a Series of 526 Patients. Southern Medical Journal, 1924, xvii, 269.

The authors made observations on 526 private patients treated for sterility. The commonest cause of sterility was azoospermia, present in 20 per cent of the husbands studied, and usually associated with evidence of gonorrheal infection. In the female (a) about one-third had noticeable cervical discharges, 24.6 per cent became pregnant after treatment; (b) about one seventh had an acid cervical leucorrhea; (c) one-sixth had pelvic infection, due in a majority of cases to puerperal or gonorrheal infection. Conservative surgery gave the best results; (d) one seventh had retrodisplacements, less than one third of which were uncomplicated.

Adherent uterus was the most frequent complication. Twenty-five per cent of the treated cases became pregnant. Uncomplicated retrodisplacement in itself is not a bar to pregnancy as four patients became pregnant after dilation of the cervix alone; (e) one-tenth had cervical stenosis, one-third becoming pregnant after treatment by passage of sounds, or dilation of the cervix. Indiscriminate use of the currette should be condemned; (f) one-eleventh had amenorrhea in varying degrees, only 8 per cent becoming pregnant after treatment. The indiscriminate use of the various glandular extracts is irrational and unscientific; (g) one-twelfth had developmental abnormalities; (h) one in twenty had uterine fibroids; of those treated by myomectomy, one-third became pregnant; of those treated otherwise only 10 per cent became pregnant; (i) one-twelfth show no cause for the sterility.

Artificial insemination was done twice, one of the patients conceiving.

Transuterine inflation of the tubes is of distinct value and shows impervious tubes in 30 to 45 per cent of cases of sterility. The therapeutic value of the Rubin test is not yet established. The only case of pregnancy following its use proved to be extrauterine. F. J. SOUBA.

Peham: The Question of Spermimmunity. Deutsche Medizinische Wochenschrift, 1925, li, 2119.

The author placed spermatozoa from the husbands of 100 women in blood serum from their wives and noted the length of time that the spermatozoa lived. The average time was 9 to 10 hours with a variation of 2 to 13. In experimenting several times with the same couple there were variations up to 6½ hours in the series. He concludes that one cannot diagnose spermimmunity from a serologic point of view. PEMBERTON.

Kok, F.: Tubal Peristalsis and the Influence of Pharmacologic Substances on Spontaneous Activity. Medizinische Klinik, 1925, xxi, 1694.

The author performed experiments on 140 human and animal fallopian tubes and found that the predominant type of movement seen was peristalsis and this was in the direction of the uterus. During pregnancy the activity in the tube is markedly diminished. In a pregnant cow the author observed that the tube of the pregnant horn showed much less activity than the tube of the nonpregnant horn. Tubes show changes in motility also during the different phases of the menstrual cycle. This difference in activity is most likely dependent upon a hormone. J. P. GREENHILL.

Kok, F.: The Cause of Sterility and Tubal Pregnancy Based Upon New Investigations of Tubal Functions. Monatsschrift für Geburtshilfe und Gynäkologie, 1927, lxxvi, 32.

Kok found that diverticula occurred in about 20 per cent of the tubes of swine. If the theory of tubal diverticula as a cause of ectopic pregnancy is correct, then tubal pregnancy should be a common occurrence among swine, but there are only two cases known of tubal pregnancy among these animals. Furthermore, a fertilized ovum can seldom be caught in a diverticulum because the ovum is fertilized not in the ampulla but in the isthmus of the tube. Kok concludes that tubal pregnancy is etiologically connected with disturbances in the mechanism of the transportation of the ovum. The cause of these disturbances lies with the hormone elaborated by the fertilized ovum, so that satisfactory peristalsis is not initiated at the proper time. Abnormal contractions may be responsible not only for tubal pregnancy but also for sterility. These contractions may be experimentally influenced by stimulation of nerves and by colloid changes. With excessive stimulation a spasm of the isthmus, if maintained long enough, may result in organic changes and these may be responsible for tubal pregnancy. J. P. Greenhill.

Geist and Goldberger: A Study of the Intramural Portion of Normal and Diseased Tubes with Special Reference to the Question of Sterility. Surgery, Gynecology and Obstetrics, 1925, xli, 646.

The studies on the intramural portion of normal and diseased tubes were carried out on extirpated organs which were injected with 20 per cent sodium iodide solution, x-rayed, and cut as interrupted serials.

It was found that variations in the course of the intramural portion of normal tubes may offer a bar to impregnation. Intramural lesions may make the passage of sperma or ova impossible and they may be present with or without closure of the fimbriated extremity. It may be possible to get a positive or negative insufflation test in diseased tubes. A positive insufflation test means that tubes are patent to gas under pressure, not necessarily to spermatozoa or ova. It is essential to locate the occlusion in a case with a negative test if any reasonable hope of assistance from operative procedure is to be entertained. Wm. C. Henske.

Rubin, I. C. Tubal Patency: Journal of American Medical Association., 1925, lxxxiv, 486.

The most suitable time for testing tubal patency is the postmenstrual phase, between the fourth and seventh day after cessation of the menstrual flow. It is then that the endometrium is at its thinnest and its secretion reduced to a minimum. The chances for interfering with an existing pregnancy or of displacing an unimpregnated ovum are practically eliminated if this phase of the menstrual cycle is chosen. The possibility of displacing endometrial particles through the tubes in the sense of Sampson's theory is given when insufflation takes place in menstruation or during bleeding on account of any other cause. The writer admits the possibility of gas embolism when the endometrium is traumatized. Pressure should not exceed 200 to 250 mm. Attempts to open tho tubes by higher pressure must be avoided. Grover Liese.

Rubin: Diagnostic Value and Therapeutic Application of Peruterine Insufflation of the Fallopian Tubes in Cases of Sterility. American Journal of Surgery, 1926, i, 1.

Rubin's early experience with collargol, thorium, bromide and iodide solutions for testing tubal patency was unfavorable because of peritoneal irritation. Oxygen therefore was substituted and injected until the abdomen was seen to rise, the patient complaining of epigastric pain and distension. This led to the present method of using a small amount of carbon dioxide. Less than 150 c.c. are required. The most favorable time to carry out insufflation is from four to seven days after the cessation of a menstrual flow. One hundred and two pregnancies were observed after peruterine insufflation, 63 times in cases of primary sterility and 39 times of relative sterility. William Kerwin.

Ott, D.: The Present Status of the Methods Used to Test Tubal Patency. Monatsschrift für Geburtshilfe und Gynäkologie, 1925, lxxi, 58.

The author considers the Rubin test and its modifications a dangerous procedure and therefore has never used it. In its place he injects into the peritoneal cavity an indifferent powder dissolved in salt solution. If the tubes are open these particles of powder may readily be seen in the cervical canal in about 24 hours. This test was performed in only six cases. The method is simple and requires no special apparatus and has no dangers. J. P. GREENHILL.

Kok, F.: Tubal Patency Test in the Diagnosis of Sterility. Medizinische Klinik. 1926, xxii, 1634.

The tubal patency test is not a harmless procedure. The greatest danger is that of pulmonary embolus. A further advance along the lines of testing out the fallopian tubes has been the injection of substances which can be seen on x-ray plates. The instillation of a 20 per cent sodium bromide solution produces a hyperemia of the tubal mucosa. Lipiodol and iodipin, while very useful also have certain disadvantages. Great force must be used to inject these substances which means that the uterus is markedly distended before the tubes are filled with the oil. In addition to air embolism, these substances invite fat embolism. An attempt to point out the exact site of tubal occlusion by means of these substances, is only rarely successful. The author, after trying various media finally returned to the transuterine injection of normal saline solution for the purpose of testing the patency of tubes. A small amount of methylene blue is added to detect any return flow from the cervix. Not only is saline solution less dangerous than all other substances, but it also passes through the tubes with even greater ease than does air. No bad results were noticed in any of his tests. J. P. GREENHILL.

Serdukoff, M. G.: Methods of Diagnosis of Tubal Sterility. Gynécologie et Obstétrique, 1926, xiv, 111.

The author studied 64 cases of sterility, 28 primary and 36 secondary. There was nonpermeability of the tubes in about 65 per cent which figure agrees roughly with that of other observers. Of the several methods for studying the condition of the tubes, salpingography is the most rational and best. It should be preceded by insufflation which may show complete occlusion and obviate the necessity of further tests. All patients should be hospitalized, and blood counts, Fahraeus reaction, and a study of the vaginal flora should be done. Contraindications are: acute or active disease of the pelvic organs, pregnancy, virulent flora or pus condition of the vagina, erosions, endocervicitis or proximity to the menstrual period. No important harmful result was observed. Heat to the abdomen is indicated following the injection.

The diagnosis by salpingography was clear in about 75 per cent of the author's cases. This method together with insufflation comprise invaluable additions to our diagnostic equipment, but are still capable of error in technic and interpretation. GOODRICH C. SCHAUFFLER.

Béclére, C. M.: The Importance of Precise Measurement of Pressure During Intrauterine Injection of Lipiodol. Gynécologie et Obstétrique, 1926, xiv, 101.

The pressure at which lipiodol is injected into the tubes should be measured by a manometer connected into the syringe system by a T tube. Thirty mm. of mercury is the optimum pressure. The author has shown by operation following injection, and by reinjection during operation that this pressure is sufficient to fill any tubes which are not definitely occluded. Pressures above 40 mm. are dangerous. The circulatory system may be invaded by the lipiodol as shown by experiments on postoperative specimens. No harm has been observed in over 30 cases injected at 30 mm. pressure. The author prefers a rubber to a metal sound for the injection. GOODRICH C. SCHAUFFLER.

Schwarz, G.: The Treatment of Female Sterility. Monatsschrift für Geburtshilfe und Gynäkologie, 1925, lxxi, 283.

In about one-third of the cases of sterility the male is at fault and in another one-third the woman but only because of disease contracted from the husband. Hence in only one-third of the cases is the woman basically to blame for sterility. Among every one hundred women who have no children during the first two years of married life only 49 subsequently have children.

Of 326 patients who were operated upon for sterility at the Marburg Clinic 259 were traced and of this number 89, or 33 per cent became pregnant after the operation. The latter consisted of dilating the cervix, curettement, irrigation of the uterus with sodium chloride and incision of the posterior lip of the cervix. A metal tube was then inserted to maintain the patency of the cervix and this was left in place for five to six days. On two occasions the uterus was perforated and perhaps also in a third case. All three patients recovered and one of these had two normal pregnancies subsequently.

Among 58 patients with normal genitalia who became pregnant after operation 16 miscarried but 11 of these later had full-term pregnancies. Among 23 patients with hypoplasia, 4 became pregnant after the operation (17.4 per cent). Among 58 patients who had an Alexander-Adams operation in addition to the above procedure (with omission of the metallic tube) 24 became pregnant after operation (41.4 per cent). Eight of these women had abortions, but five of them subsequently had full-term pregnancies. J. P. Greenhill.

Strassmann: Plastic Restoration of Continuity Between the Tube and the Uterus —Implantation of the Tube in the Uterus. Zentralblatt für Gynäkologie, 1924, xlviii, 1681.

Strassmann reports a case where, owing to the presence of an ovarian tumor with an interstitial pregnancy, one tube was removed completely and also the uterine end of the opposite tube. The distal portion of the severed tube was then implanted into the uterine cornu in the same manner one would implant a cut ureter into the bladder.

In a second case, a bilateral salpingitis, a new ostium was made on one side, after resection of the fimbriated end; and on the opposite side, which was the seat of a salpingitis isthmica nodosa, a portion of the tube was resected and the distal portion implanted into an opening made into the uterine horn.

The possibility of making use of this operation in the case of interstitial or tubal pregnancy is important. The author also suggests the possibility of making use of the vermiform appendix as a tube where both fallopian tubes have been removed. Little.

Ritter, O.: Salpingostomy in the Treatment of Sterility Due to Tubal Occlusion. Monatsschrift für Geburtshilfe und Gynäkologie, 1925, lxxi, 70.

Salpingostomy was performed on 65 patients, both unilateral and bilateral. Of these, 6 could not be traced, 8 were not married, and 7 who had one normal tube and a salpingostomy on the other side became pregnant. There were no pregnancies in 40 cases where the mended tube or tubes were the only paths for the ova. Four patients, however, did become pregnant who had only one tube and that the one operated upon. Only one of these patients went to term. Two others had a miscarriage, while the third had a second ectopic pregnancy. Salpingostomy, therefore, yielded only 9 per cent of pregnancies (4 out of 44). In performing salpingostomy two conditions are necessary, first, the path leading from the tube to the uterus must be open and second, the artificial opening must remain patent. The best results are obtained in the cases where tubal occlusion is due to sepsis, while the least favorable results are in the cases due to gonorrhea and tuberculosis. After plastic operations on the tube patency must be maintained by tubal insufflation and heat.

There need be no fear of ectopic pregnancy after plastic operations on the tube. The patient who had a tubal pregnancy after operation had had the other tube removed because of the same condition and evidently she had a predisposition to ectopic pregnancy. A greater disadvantage of plastic operations is the tendency to abortion. This may be due to the fact that the fertilized ovum has only a short distance to travel and hence reaches the uterus before it has arrived at the stage of development required for implantation. Abortions may also be due to the cause of the tubal closure, namely, tuberculosis, perimetritis, etc.

J. P. Greenhill.

Fuchs, H.: Pertubation and Salpingostomy in the Treatment of Sterility. Monatsschrift für Geburtshilfe und Gynäkologie, 1926, lxxv, 56.

According to Fuchs, there are in the German literature only 5 reported cases where pregnancy followed as the direct result of a tubal patency test. He reports nine additional cases. In eight of these patients the pregnancy continued to full term. In 5 of the 9 cases the ovum of the next menstrual cycle was fertilized Aside from the gross mechanical effect of blowing air through the tubes, the author believes that pregnancy follows this procedure because of the hyperemia and mobility of the tubes produced by the injection of a gas. The author's 9 successes occurred in a series of 100 tubal patency tests.

Among 34 women who were followed after plastic operations on the tubes, 2 were found who became pregnant. One patient had an intrauterine pregnancy which went to term and the other had an ectopic pregnancy. In the literature there are only 4 additional cases where an ectopic pregnancy followed plastic operations on the tubes. All of these occurred in the tube left after removal of the other tube for an ectopic pregnancy. They indicate that when a tube is removed for an ectopic pregnancy and the other tube is found closed, the latter should not be opened because the endosalpingial changes in it predispose to an ectopic pregnancy. The fact remains that after salpingostomy operations there occurred 40 intrauterine pregnancies and only one ectopic pregnancy, if we omit the cases of repeated ectopic pregnancy just mentioned. After plastic operations the tubes should be tested with air for patency and in two-thirds of the cases they will be found open.

J. P. Greenhill.

Mandelstamm, A.: Tubal Implantation into the Uterus. Monatsschrift für Geburtshilfe und Gynäkologie, 1926, lxxiii, 138.

The author reports 8 cases of tubal implantation in all of which the Rubin test had previously failed to demonstrate patency. Before the tubal implantation operation the following points were made certain: (1) A normal sediment reaction; (2) normal urethral and cervical secretions; (3) clean vagina; (4) normal size and mobility of the adnexa; (5) potency of the husband. In these cases the tubes were implanted into the uterus through an incision in the posterior wall. The cases were subsequently tested for tubal patency but no gas passed through the tubes. In two additional cases in which the intramural portions of the tubes were removed by a circular incision, and the tubes implanted into the cornua, subsequent Rubin tests were positive. The author points out that normal anatomic relationships must be maintained, hence the tube should be implanted in the uterine cornua after the removal of the obliterated intramural part. To make certain that the tubal orifice remains patent it is advisable to divide the proximal end into two flaps and sew the mucosa to the serosa. The length of the implanted part should be as great as the interstitial portion removed. J. P. GREENHILL.

Unterberger, F.: Plastic Operations on the Tubes, Tubal Insufflation, and Tubal Implantation. Monatsschrift für Geburtshilfe und Gynäkologie, 1925, lxxi, 63.

In certain cases of tubal occlusion an attempt should be made to secure patency by operation. The author makes a T-incision in the occluded tube and everts the edges of the wound with catgut sutures. The ovary must be free and new wound surfaces avoided. Nearly always the operation is combined with a ventro-fixation. This operation was performed 57 times by the author, in most cases as an accessory operation to the main indication for laparotomy. There was no mortality and five women (8.77 per cent) became pregnant after the operation. In four of these five patients tubal closure had been due to perisalpingitis and in only one had there been an endosalpingitis.

The author has also performed tubal implantation three times. In the first case a Rubin test after the operation showed that the implanted tube was patent. In one case no menses appeared after operation and this patient is now pregnant after 11½ years of sterility. This is the first case of pregnancy following a tubal implantation in Europe. The author believes this patient should be delivered by cesarean section because the site of implantation into the uterus is a locus minoris resistentiae. Whether the danger of rupture of the uterus after tubal implantation is greater than the scar left after a deep myomectomy is still an open question. J. P. GREENHILL.

Cullen: A Normal Pregnancy Following Insertion of the Outer Half of a Fallopian Tube Into the Uterine Cornu. Bulletin of the Johns Hopkins Hospital, 1922, xxxiii, 344.

Patient was operated upon October 6, 1919, for left cornual pregnancy. This was removed, saving the outer half of the left tube and suturing its inner end into the uterine horn. Her right tube and ovary had been removed by another surgeon several years before. On March 11, 1921, she had a stillborn child at the end of the seventh month of gestation. There was a placenta previa. June 26, 1922, she had a normal labor and a living child. C. O. MALAND.

Reist: The Dangers and Results of the Use of Contraconceptive Instruments Such as the Obturator, Sterilet or Fructulet of Nassauer. Schweizer medizinische Wochenschrift, 1924, liv, 650.

A large number of infections and deaths occur from the use of various instruments employed for the purpose of preventing pregnancy. He condemns in no uncertain terms the use of the contraconceptive "pessary" of any sort and offers the following list of cases he has collected: Deaths—general peritonitis and sepsis 17; widespread parametritis 70; general peritonitis 38; pelvic peritonitis 6; septic abortion 62; damage to uterine wall by instruments 5; perforation of uterus 1; of bladder 2 and of pouch of Douglas 1.

Septic endometritis with involvement of surrounding tissue 75; pressure ulcers of cervix or uterine body 12; uncontrollable uterine bleeding 60; crampy uterine pain 28, and ectopic pregnancies 4. A. C. WILLIAMSON.

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Original Communications

THE RESPONSIBILITY OF THE OBSTETRIC TEACHER IN RELATION TO MATERNAL MORTALITY AND MORBIDITY*

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In recent years and especially since the termination of the World War there has been in all countries an increasing interest in and anxiety regarding maternal mortality and morbidity. All sorts of inquiries and commissions have been set up and reports published with so far, little apparent result. I say apparent result because statistics are traditionally unreliable and in the case of the maternal death rate more so than usual. When we try to compare the maternal death rate today with what it was fifty years ago we are attempting the impossible for the figures of fifty years ago, when registration was very defective in all such countries as had it, are not true figures.

For example, registration of deaths in its present form was begun in Scotland in 1855 and it is startling to find that the maternal death rate from all causes was apparently higher in the years 1915-1922 than in the years 1855-1864, whilst the death rate from puerperal sepsis was the same in the two periods. (Table I.)

It is inconceivable that the death rate from puerperal sepsis is as high today as it was in 1855. At that time the teaching of Semmelweis had not been generally accepted. White's teaching has been largely forgotten.

Epidemics of childbed fever were still frequent in hospitals and of course Listerism was not yet born. There must be a fallacy some-

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*Read at a meeting of the Obstetrical Society of Philadelphia, December 2, 1926.

Note: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

TABLE I. DEATHS FROM PUERPERAL CAUSES IN SCOTLAND, 1855-1922—DECENNIAL MEANS

YEARS	TOTAL DEATHS	METRIA OR PUERPERAL FEVER	OTHER DISEASES AND ACCIDENTS OF CHILDBIRTH	TOTAL	PUERPURAL FEVER	OTHER DISEASES OF CHILDBIRTH
1855—1864	512	180	332	4.9	1.7	3.2
1865—1874	595	213	382	5.1	1.8	3.3
1875—1884	660	252	408	5.2	2.0	3.2
1885—1894	658	306	353	5.3	2.5	2.8
1895—1904	605	246	359	4.6	1.9	2.7
1905—1914	703	216	488	5.6	1.7	3.9
1915—1922	704	194	510	6.2	1.7	4.5

TABLE II. RECORDS OF DR. C. E. DOUGLAS AND HIS PREDECESSOR IN PRACTICE

DATE	NUMBER OF CASES	DEATHS FROM SEPSIS	RATE PER 1,000
1847-1864	936	16	17.0
1880-1891	550	4	7.2
1891-1923	1670	2	1.7

where and this is borne out by a most interesting communication by Dr. C. E. Douglas who has in his possession the full midwifery records of his predecessor in a mixed town and country practice in Scotland. In his case book there is a record of 936 cases attended between 1847 and 1864. (Table II.) There were twenty maternal deaths, giving a rate of 21 per thousand. In the ten years ending 1864 the general maternal death rate for the whole of Scotland, according to the Registrar's returns, was 4.9 per thousand. In 14 of the 20 who died no mention is made of any complication or operative interference at delivery, so it may be assumed that they died of sepsis—a mortality rate from sepsis of 17 per thousand. As Douglas points out, such a rate is not surprising when we realize the nature of the obstetric procedures of these times. A tedious first stage was treated by venesection in the first instance, followed by "an opiate enema"; if this did not suffice the os was dilated manually. The second stage was mainly concerned with support of the perineum, for hours if need be. Hamilton mentions having done this for twelve hours without leaving the patient—and "fine lard," to the extent of a pound for a case, was used to lubricate the passage. The third stage was a still more extraordinary performance. You felt along the cord till you could reach the center of the placenta, and if this could be done it was ready for extraction. Twisting the cord around the fingers of the right hand you pulled on it till it came away, again supporting the perineum with the left hand. If the placenta were retained for more than an hour it should be removed. If adherent, the placenta is to be grasped by the examining hand, and "pressure is now to be made upon its substance, bringing its circumference towards its center and detaching leisurely and carefully all that can be separated by this manipulation. The separated mass is to be extracted by pulling with the navel string."

In the same district, Douglas himself has practiced and from 1880 to 1923 attended 2,200 midwifery cases. From 1880 to 1891, the time during which it was beginning to be realized how important antiseptic precautions were, he had 550 cases with a septic mortality of 7.2 per 1000. From 1891 to 1923 he had 1670 cases with a septic mortality of 1.7 per 1000. (Table II.) Those figures are, probably, far more reliable than those of the Registrar-General, although the numbers dealt with are small, and they go to show that there has been a very considerable reduction in the death rate from sepsis and other causes in the last seventy years.

We cannot, however, get away from our present day figures of maternal mortality and they are very much the same in all countries in which registration of deaths is on a comparable basis. I quote the Scottish figures as being more immediately familiar to me but they differ little from those of the United States and it is not my intention to draw comparisons. It may be said generally that the maternal mortality from all causes in all countries varies from 4 to 7 per thousand and that it has shown little change in the past twenty years. Dr. Janet Campbell writing of England says, "The general death rate has been reduced one-third; the infant mortality rate has been halved since the beginning of the century, yet the maternal mortality rate is little lower than it was twenty years ago." *(Maternal Mortality, Ministry of Health Publication, London, 1926.)*

While it is certain, therefore, that the maternal death rate has been reduced in the last fifty years it has not shown that rapid diminution observed in the general death rate in recent years. Is this because we have reached the irreducible minimum or are some of these deaths preventable? It is held by some, and there are certain biologic facts to support them, that the pregnant and parturient woman has "an increased susceptibility to death" (Douglas) as compared with her nulliparous sister and that the process of reproduction must in certain instances result in the death of the mother. Those of us who are engaged in hospital and consulting obstetric work realize, however, that maternal deaths, in many instances, are not the direct result of the parturient process as nature planned it but are the result of ill advised, ill timed or misdirected efforts to supplement or supplant nature's methods.

We have heard a great deal in recent years about obstetrics being a surgical specialty and that the obstetrician should be first and foremost a surgeon. That is all to the good in so far as this conception has been the big factor in improving the technic of the delivery room but it is all to the bad if it leads the budding practitioner to think that every case must be subjected to surgical procedures. Therefore, along with this insistence on the surgical nature of obstetrics there must go a redoubled effort on the part of teachers to impress upon their students the essential normality of the vast majority of cases and the dangers of unnecessary interference.

There is a greater need today than ever there was to preach against "meddlesome midwifery" because with our increased hospital facilities, the attendance of trained nurses, and the ease with which a "set up" for the operation can be made there is a greater temptation to interfere. Do our students in their hospital training see too many instrumental deliveries in proportion to normal deliveries? Speaking from my own experience I think that they do and that they are likely to go away with a wrong impression unless the teacher is at pains to discuss fully with them the indications for every interference. They see the skilled obstetrician emerge successfully from a difficult forceps case, or version and breech delivery and do not always realize that his success is due partly to the ideal conditions under which he is working as regards "set up" and assistance, partly to his individual skill, and that if they attempted the same procedure in the home of one of their future patients they would be lacking in both. They do realize this in the case of a major surgical operation and from this point of view it must be driven into them that operative obstetrics is surgery and very often major surgery and that before they can undertake these operations they must have more training than they can possibly receive in their undergraduate course.

Such a statement at once raises the question as to how much we can teach the student before graduation and, in the absence of any future special hospital training, how much obstetric work such teaching equips him for. This question has been answered more fully in the case of medicine and surgery than it has been in obstetrics. An undergraduate course in surgery does not pretend to train the student as a surgeon. It aims at training him in diagnosis, in being able to recognize the necessity for surgical interference, and in the performance of minor surgical operations. Our aim as obstetric teachers should be the same.

How best to accomplish that aim is in some details a matter of opinion. I, personally, am convinced that a course of theoretic instruction should precede clinical study and that that instruction should be largely in the form of lectures and demonstrations, supplemented by the reading of a standard textbook. Trained as I was in the Edinburgh School where the systematic lecture constituted and still constitutes such an important part of the student's training I may be regarded as prejudiced, but experience of other methods in other schools has confirmed me in my belief that it is only by such means that the average student can be grounded in the principles of the subject and be given that broad outlook which is essential to the clinical application of these. The lectures should reflect the individuality of the lecturer. They should deal with broad facts of anatomy and physiology and should be freely illustrated by clinical word pictures. They should be dogmatic,—the student will learn to argue about them later. They should all be given, I think, by the same man and he should be the senior member, or one of the senior members, of the department. After such a broad survey of the whole subject, and this can be easily accomplished in forty or fifty lectures, the student is in a position to benefit from his individual clinical instruction and contact with patients in a way which would be otherwise impossible.

In most medical schools the time set apart in the curriculum for clinical obstetrics is too short. An absolute essential is that the work should be concentrated and that over a certain period it should be the only activity of the student. A period of actual residence in the hospital or in a hostel in connection with it is necessary if he is to get the full benefit.

In planning the student's course of clinical instruction emphasis should be laid on diagnosis and this can be learned only in the prenatal clinic and prenatal wards. In all our teaching hospitals we now have large prenatal clinics which afford ample material for instruction. This should consist in a thorough training in clinical pelvimetry and abdominal palpation. It is most gratifying to find how quickly the student acquires proficiency in these if he is given the proper instruction and guidance at the beginning. It requires patience and time on the part of the teacher but these are amply repaid when he finds that after a short time his student can fairly accurately measure and type a pelvis, diagnose presentation and position and form an estimate of the relative size of head to pelvic brim. If we could insure that every graduate left his medical school with such a training, that he appreciated the importance of such examinations in every case and realized that a disproportion called for further examination and consultation before the onset of labor we could confidently look for a marked diminution in the maternal death rate within the next few years. It is well within our capacity to give such training and well within the capacity of the student of today to fully avail himself of it. In this one direction alone there are, therefore, great possibilities.

In the prenatal clinic also he must be taught the importance of the various complications of pregnancy especially the early and late toxemias, the anemias, the heart affections, the focal infections. He should see carried out, and should carry out himself, a full physical examination of the patients, take their blood pressures, examine their urines. When abnormalities are detected he listens to the advice given them. He follows them into the prenatal wards when their condition calls for hospitalization. He is soon struck by the number requiring such hospital care. The late Dr. Studdiford found that over a period of seven years, 20 per cent of the patients attending the prenatal clinic at the Sloane Hospital required special advice and treatment and that 12 per cent were admitted to the prenatal wards. The student is thus impressed with the importance of prenatal care and sees the rapid improvement in the patients as the result of appropriate treatment begun early. It is brought home to him that eclampsia is a preventable disease and to have it occur in a patient for whom he is responsible is a reflection on himself.

He will not get all this from his work unless he is guided and taught. There must be an atmosphere of enthusiasm at every clinic. It is all very prosaic to us but it is all new to him. He is keen to learn, keen to recognize the various conditions he has heard and read of, and elated when he does so. To my mind there is no stronger argument for a systematic theoretic training before the beginning of clinical work than this joy of being able to recognize in the patient before him some condition about which he already knows. Knowledge so acquired is never likely to be forgotten, even when with passing years enthusiasms wane.

With such teaching and practice in the prenatal department the student is in a position to study and conduct labor. He has passed through his hands patients who have been labelled as normal and for whom a normal unaided labor is anticipated. He has given them a good prognosis. If he has not done so himself he finds from the history sheet that some one else has. When he sees these patients in the labor room he knows that, given time, the great majority will deliver themselves unaided. His part is to maintain an attitude of watchful waiting. The training he has got in abdominal palpation enables him to diagnose with certainty presentation and position without vaginal examination. He must be taught to follow the progress of the labor from the frequency and strength of the pains and the behavior of the patient during them. The descent of the head during the second stage is followed by abdominal palpation. It is impressed on him that every vaginal examination is a possible danger to the patient. He keeps careful watch on the fetal heart. He is in close touch with the patient throughout the whole duration of the labor.

His surgical training ought to have drilled him in aseptic technic. My experience is that he is often sadly deficient in this. I hope our surgical colleagues are duly grateful to us for directing and completing this part of the student's education. That technic should be as simple as efficiency will permit. In his early years of practice the young graduate will probably have to do his work under less favorable conditions than in his school hospital and he should be able to appreciate and insist on the essentials. When operative delivery is necessary the definite indications for it ought to be explained and discussed. In undergraduate teaching such procedures as "prophylactic forceps" and routine version have no place. He must be given practice in the various obstetric manipulations and operations but the proper place for that is in the manikin room.

A not inconsiderable part of the total maternal mortality is from the antepartum hemorrhages. What should we teach our students regarding the treatment of these? The only safe teaching to my mind is to impress on them more and more the seriousness of every such case and the absolute necessity for consultation and hospital care as soon as the condition shows itself. The cases which end fatally are usually those which have been temporized with in their own homes and admitted to hospital only after repeated hemorrhages and attempts at treatment such as packing. Those which survive the immediate hemorrhage help to swell the septic death rate.

And when sepsis does supervene under those or under any other circumstances what ought we to teach them regarding it? In the first place we must try to visualize for them the actual processes going on in the body. We must picture to them a large, rather flabby, very vascular and edematous organ undergoing more or less rhythmic contractions which produce periodic changes in the state of fulness or emptiness of the large venous sinuses and lymphatic channels. As it contracts blood and lymph are being squeezed out of these channels into the general blood and lymph stream. As it relaxes material from the interior of the uterus may be sucked into them, and so, at the next contraction, be passed on to the general circulation. The inner surface is a large raw or granulating area with tags of varying size of dead and dying tissue attached to it. In these are numerous organisms of various kinds, for the most part harmless saprophytes but also pathogenic or potentially pathogenic germs. In the fight against these we picture the barrier zone of leucocytes in the layer just under the surface, and we imagine the attack of the hosts of bacteria being repelled by them. We hope that the defenders will win the day, and that, with the death of the last invader, victory will be won. We dread the giving way of this first line of defence and do everything to preserve it, and would not wilfully remove it. Its giving way is indicated to us by the prolongation of the fever, by the more rapid pulse, by the more toxic condition of our patient, by the noninvolution of the uterus. We are almost certain a breach has been made in it when a rigor occurs, and we are sure when we find the organisms in the blood. But the fight is not yet over. We now imagine the deeper parts of the uterine wall invaded but defences being rushed up—the leucocytes and tissue cells are reacting and proliferating, the serum has developed in it antibodies which, like poison gas, stupify the organisms and render them easy victims for the leucocytes or kill them outright. Those that invade the blood stream do not long survive and recovery may take place. Or we see the attack directed along the lymph channels. The temperature is high but fairly steady, there is pain, there is tenderness above the brim of the pelvis, there is induration to be felt—a cellulitis has developed. Cellulitis means strong reaction on the part of the tissue cells, and we rejoice for the localization. But it must be watched. Resistance may still be insufficient and suppuration may occur, which must be detected early to prevent wide extension. Or again resisted in the actual tissues we imagine the organisms working their way insidiously along the venous channels, producing thrombosis as they go, and escaping from time to time in large numbers into the blood stream or carried into it on small emboli. This is the picture when, after days of high fever, our patient has recurrent rigors with hyperpyrexia and positive blood culture, a septic thrombophlebitis. Her state is now more than serious, but there is still a slender hope of recovery.

Or we see the defence fail altogether and the leucocytes and tissue cells killed off in great numbers. Minute beads of pus everywhere form in the thrombosed vessels and in the lymphatic channels, the tissue cells are felled by the toxins, they have made their utmost effort, and are incapable of more. The organisms march on, invading every part of the body through blood and lymph stream, settling down to renewed effort in those parts that please them—the serous surfaces, the lungs, the heart. The woman is doomed.

All of which leads up to an emphasis of the danger of interference with the interior of the uterus in cases of sepsis, postpartum or postabortal.

With such training as a student can the doctor live up to his ideals in practice? Let us grant at once that it is difficult for him to do so. In the first place he is handicapped in his prenatal work by the failure of his patients to consult him early in pregnancy. With the education of the public the importance of antenatal supervision is being brought home to women and in the future less and less difficulty will be experienced in this direction. The medical profession in the United States deserves great credit for the enlightening of the public in this regard. Ballantyne of Edinburgh was one of the first to impress upon us the importance of antenatal care but Scotland and England have lagged behind this country in the provisions made for carrying it out. They are now very much alive to the necessity and there will be a rapid improvement in the immediate future. The big problem there, as here, is in the rural areas.

Where hospital accommodation is obtainable it is easier for the practitioner to live up to his ideals in the conduct of labor than when he has to practice domestic obstetrics. In the latter the importunity of relatives and the saving of his own time tempt him to interfere when his better judgment would restrain him. In the hospital his patient is watched by competent internes or nurses while he proceeds with the rest of his day's work and he is called only when necessary. Are something approaching the same conditions obtainable in domestic practice?

As you know, in Britain, a large percentage,—50 per cent or more of the women are delivered by trained midwives. The maternal mortality among the cases so cared for is certainly not higher, and in many areas is lower, than in those delivered by doctors. The drawback to the midwife is that she is not capable of giving adequate antenatal supervision. There is, therefore, a growing feeling among obstetric teachers in Britain that in large industrial areas and in rural districts there ought to be active cooperation between doctor and midwife, that while the former should be responsible for the antenatal care of the patient the latter should, in normal cases, be in attendance at the delivery, calling in the doctor only should necessity for interference arise. I know several very busy practitioners in working-class communities who have organized their obstetric work along these lines. One of them, who has the assistance of two or three trained and registered midwives, informed me recently that he had reduced the incidence of forceps delivery in his practice from 30 per cent to 3 per cent and that he now has leisure for reading and attending society meetings which he never had formerly. I mention these facts for your information and not with any idea that conditions here would necessarily permit of such an arrangement in our industrial and rural areas. There are many aspects of the midwife problem in Britain which are disturbing and call for investigation and improvement. One is that the best type of fully trained nurse does not take up this work because of the uncertain and often poor financial return and because of the poor social status she has. With such a system of cooperation with the doctor I think that a better type of woman would go in for the profession and quickly take her proper place in the community. If some such thing came about I feel certain that it would go a long way to solve the problem so far as Britain is concerned.

I do not yet know enough of conditions here to venture any opinion as to how such a system would work in the United States. The word midwife conveys a different meaning here from what it does in Britain and European countries. The "Trained Obstetric Nurse" would be a better designation. Is it possible that,—I know the subject has been discussed by many and I ask the question for my own information,—the active cooperation of the "Trained Obstetric Nurse" and the doctor may be a possible way in which to overcome the difficulty of the large domiciliary obstetric practice? Such a nurse would act the part the interne does in hospital practice. She would require to be trained in the conduct of labor as well as in obstetric nursing. Those of us who have been accustomed to working in hospitals with such well-trained nurses know how efficient they become, how accurate their diagnosis and prognosis and how reliable they are in every way. Until sufficient hospital accommodation is provided to take care of every delivery, and it will be a long time till that comes about throughout the country, it seems to me that this method may have possibilities. It would give the busy practitioner conditions approaching those enjoyed by the hospital obstetrician and would enable him to maintain the standard of obstetrics at a higher general level than has hitherto been possible.

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(For discussion, see page 396.)

A STUDY OF AN UNDESCRIBED TYPE OF PREMATURE SEPARATION OF THE NORMALLY IMPLANTED PLACENTA

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IN THE present paper, the report is given of a case of profuse concealed hemorrhage derived from a very small area of separation of the normally implanted placenta. It seems worthy of being recorded mainly because of the minute size of the area of separation, as well as because of the concomitant abnormal conditions which apparently played a part in the production of the accident, and which in turn decided the treatment employed.

The patient, an unregistered multipara aged 39 years, was seen by the Outside Service on the evening of August 5, 1926. She gave a history of having had nine spontaneous deliveries at term and two premature labors. Previous medical history was negative. Date of last menstrual period, first half of January, date of quickening, May. She stated that the pregnancy was uneventful until 2:00 P.M. today, when she noticed slight abdominal pain, which became continuous and severe six hours later. On admission to the hospital, the following data were ascertained: Patient restless, expression anxious. Visible mucous membranes pale; slight edema of the ankles; urine contains small amount of albumin; blood pressure 190/145; pulse 120 and fairly strong. Uterus was spherical in shape with fundus three fingers beneath the xiphoid process, in continuous tetanic contraction, and was extremely tender particularly in the region of the lower uterine segment. Owing to the ligneous consistency of the uterine wall, the child's position could not be determined. Fetal heart inaudible. Rectal examination showed the external os 2 cm., with cervical margins thick and unyielding.

The sudden onset of persistent abdominal pain, acute anemia, the ligneous consistency of the uterus, and the serious general condition of the patient, pointed to the presence of concealed hemorrhage. As a preliminary to blood transfusion, the patient's blood was matched. The extreme sensitiveness of the lower uterine segment, which seemed to point to an overstretching of its walls or to intramuscular hemorrhage, which would probably be associated with deficient retraction, made me fear the possibility of postpartum hemorrhage and was the decisive factor in causing me to elect the abdominal route. Moreover, the existence of a severe toxemia, and the fact that when the uterus was exposed it was found to be studded with numerous myomatous nodules, as well as presenting the characteristic copper-like discoloration of its anterior wall, made me feel that supravaginal amputation of the unopened uterus would be the wisest course.

Upon opening the abdomen, a certain amount of blood stained fluid escaped, and upon eviscerating the uterus it was found that the veins of the left broad ligament were intensely engorged. The unopened uterus was then removed along with the left appendages, while the right appendages were left in situ. The cervical stump was cared for in the usual manner and the bladder peritoneum sutured to the posterior surface of the cervix. The abdominal wall was closed in three layers. At the end of the operation, which lasted forty minutes, 500 c.c. of citrated blood were transfused. The patient stood the operation well and was discharged in excellent condition after 18 days, with a blood pressure 128/80 and normal kidney function.

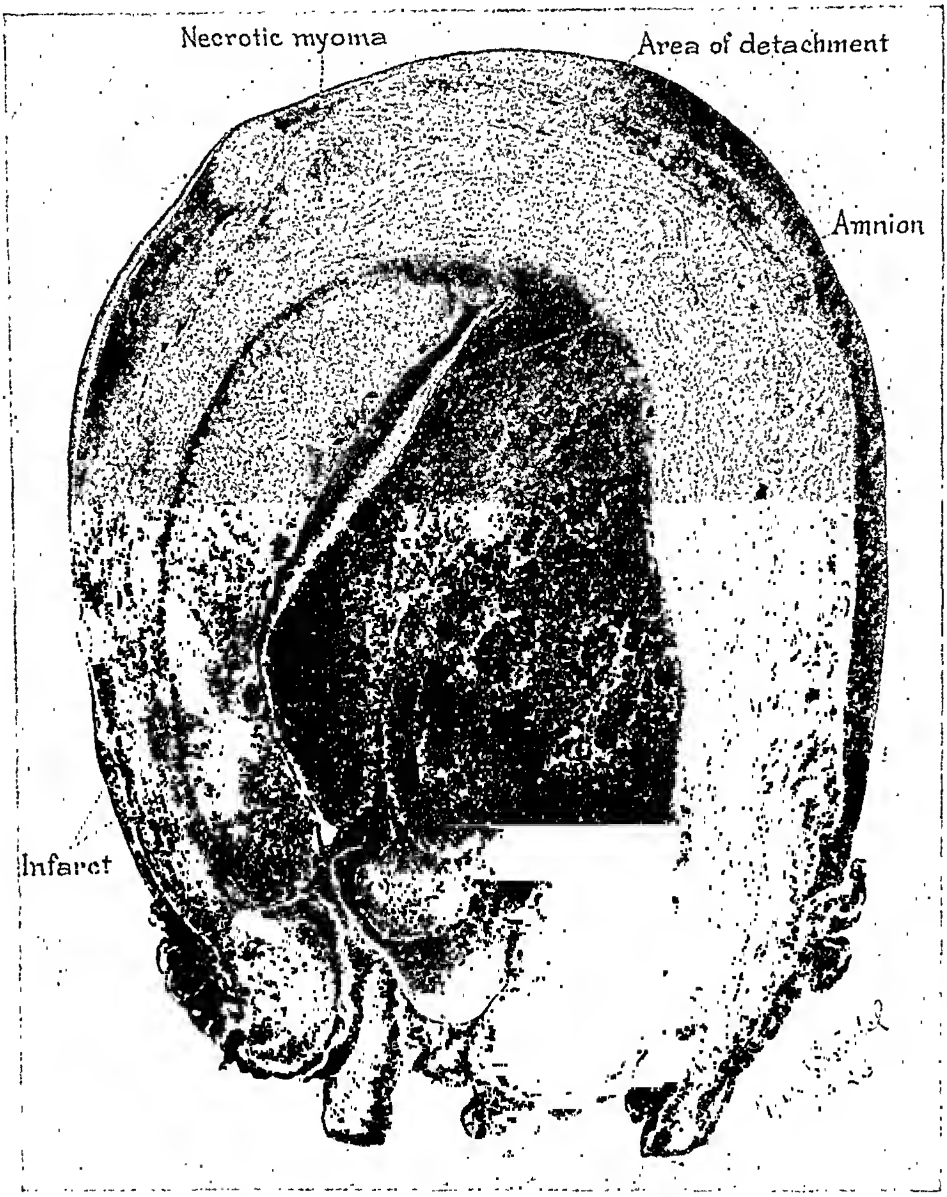

Fig. 1.

Description of the Specimen

The uterus measures 19x15x14 cm. Its anterior surface presents a blood stained, mottled appearance, which is most marked on the left side and especially towards the margin where it extends into the broad ligament. There was almost no discoloration on the posterior wall. The entire uterus was studded with small myomata, the largest being 1.5 c.m. in diameter.

The child, 30 cm. long, was extruded spontaneously through the area of amputation when the specimen was placed in formalin. Protruding from the cut end are masses of clots, while the placenta itself is still in situ.

After hardening, the uterus was incised by a sagittal mesial section, when it was found that the placenta was adherent throughout to the posterior wall of the uterus, and that no area of separation was visible. The membranes were separated from the anterior uterine wall by an oval mass of coagulated blood and were in direct contact with the fetal surface of the placenta. In the line of section, the placenta measures 12 cm. in length and 3.5 at its point of greatest thickness. The anterior uterine wall is thicker than the posterior, measuring 3.5 and 2 cm. respectively. The finger introduced into the left half of the specimen apparently finds that the separation had occurred in the left half of the uterus.

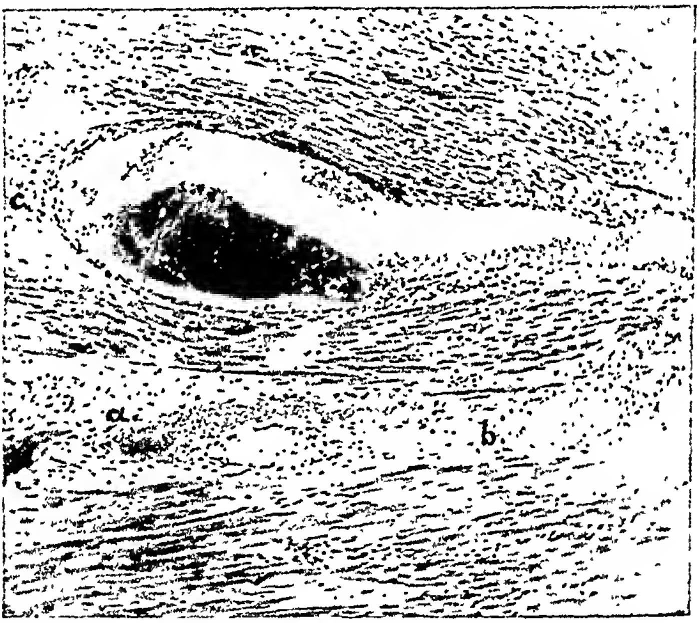

Fig. 2.—*a*, Extravasation of blood around a small vein. *b*, Edematous area. *c*, Distended vein showing formation of thrombus.

In the search for the area of separation, a second sagittal section was made through the right half of the specimen 2.5 cm. from the midline, and the placenta was found to be in situ throughout. The remainder of the right half was then cut into six horizontal slabs and normal relations of the placenta were found in the lower five, but in the sixth or uppermost one, which includes the *fundal* region, it is seen that a small area of separation exists at the upper pole of the placenta. This measures 20 mm. in length and 5 mm. in height, and the blood contained in it apparently communicates with the submembranous *hematoma.* (See Fig. 1.) The left half of the uterus was also cut into horizontal slabs but the only area of separation discoverable was the one just described.

Microscopic examination shows a normal placenta in situ, with a normal decidua basalis presenting no signs of leucocytic reaction. *In places, many fetal giant* cells are present in the decidua and adjoining muscularis. The fetal surface presents well preserved amniotic epithelium and a normal chorionic membrane. Except for small areas of typical and atypical infarct formation, the entire placenta is normal.

Sections through the single minute area of placental separation show that the decidua is disintegrated by hemorrhage with a part still attached to the maternal surface of the placenta, and the rest to the uterine wall, while between the two layers is free blood. The decidual vessels are markedly distended and in the lumina of the uterine glands is free blood. Nowhere are there any signs of inflammatory reaction.

In accord with the gross appearance, the membranes from the anterior wall can be seen in contact with the fetal surface of the placenta, and between them and the anterior wall is a mass of coagulated blood.

The muscular disassociation varies in different places. In the area in which it is most pronounced, the veins are greatly distended in such areas, and in marked contrast to those elsewhere in the uterus. The muscle fibers are spread by hemorrhage and edema, and in the latter many clasmatocytes can be made out. By consulting the microphotograph, it appears that the extravasated blood has escaped from the smaller veins and capillaries. The myomata within the uterine wall present the usual structure except for areas of partial necrosis which was visible in places, even on gross examination.

DISCUSSION

The specimen is of interest on account of the very small area of separation associated with pronounced clinical symptoms, and which, nevertheless, had led to abundant concealed hemorrhage which was sufficiently extensive to peel the membranes off from the entire uterine wall except at the placental site. The condition is very surprising, as it seems a priori improbable that a concealed hemorrhage of 600 c.c. could have originated from the minute area of separation which was detected in the fundal region. The specimen serves to provide confirmatory evidence of the statement made by Williams that hemorrhage into the depths of the decidua appears to be the immediate factor in bringing about the detachment of placental tissue, although in the present case, the process was only a localized phenomenon. The blood escaping between uterine wall and the placental margin, as it increased in amount gradually separated the membranes from the tissues to which they had been attached, and led to the formation of the submembranous hematoma. On the other hand, owing to the firm adherence of the membranes to the lower uterine segment, the hemorrhage remained concealed, and only a small amount of blood found its way into the vagina some hours preceding the onset of the serious condition. It seems reasonable to assume that the tense uterine wall led to an increase in intrauterine pressure, thus checking temporarily the bleeding and allowing coagulation to take place, and Fig. 1 shows that a certain amount of serum had been expressed from the dependent portion of the blood-clot.

Hysterectomy was adopted in this case, as the procedure best fitted to assure hemostasis, since the presence of multiple myomata and extensive hemorrhagic infiltration pointed to a seriously damaged condition of the uterine muscle with the attendant probability of serious postpartum bleeding had the uterus been retained. In addition, it served to sterilize the patient—a desideratum which was important in this instance as the patient had already given birth to twelve children, and especially since Couvelaire, Williams, Thaler and others have reported that repeated premature separation may occur in successive pregnancies. It is interesting to note that my review of the literature reveals only five references to successful results following abdominal hysterectomy without opening the uterus, for premature separation of the normally implanted placenta. (Malcolm Storer, v. Franqué, Zweifel, Thaler, Heidenhain.)

ETIOLOGY

Since the recent work on the pathology of premature separation of the normally implanted placenta, more particularly the studies of Couvelaire and Williams, had made it clear that we are dealing here with a definite clinical entity in which a serious involvement of the uterine wall constitutes the predominant feature, considerable interest has centered around the nature of this condition. The significant part in its pathology, as pointed out in my paper last year, is due to a lesion of the walls of the capillaries and small veins which allows plasma and red bood cells to leave the vessels in the affected areas, thus giving rise to marked edema and hemorrhages by which the muscle bundles are spread apart. It is the capillary toxicosis which constitutes the prominent feature of this condition and of eclampsia as well. DeLee in 1901 drew attention to the hemophilic nature of some cases of premature separation of the normally implanted placenta. The preponderance of evidence accumulated during the last few years both from clinical observation and autopsy findings points to a toxic element as the underlying factor in the production of premature separation of the placenta, in at least the majority of the severe cases. Williams, in his recent papers, discusses fully the pros and cons of such a reasoning, and compares the conditions with those following the action of the venom of certain snakes. The experimental work of Flexner and Noguchi shows that such poisons contain protein toxins which produce hemorrhage in various organs, chiefly as the result of endothelial injury and thrombosis; hence the term "hemorrhagin" has been used to designate their essential properties. We should remember in this connection that it is the presence of platelet thrombi and endothelial injury in the uterine wall and in the adjacent tissues which stamps the peculiar pathology of premature separation.

In the hope of learning something concerning the nature of the toxic processes obtaining in this condition, Dr. Geiling and I performed a series of experiments last year, in which the mechanism operative in the production of premature separation of the normally implanted placenta could be simulated in pregnant animals by the intravenous administration of histamin. It is this substance, as well as a number of allied members of the "histamin group," whose effect, according to the studies of Hanzlik and coworkers, is primarily characterized by endothelial injury, which renders the capillaries more pervious to the escape of fluid and corpuscles, hemagglutination—in this way promoting the occurrence of thrombi, and at times hemolysis.

The reactions which supervene in the liver and kidneys of carnivora following the intravenous injection of histamin are described in some detail in my paper, and the striking similarity between the histologic changes obtained in these organs in acute histamin intoxication and those in eclampsia is mentioned. These observations, coupled with the most remarkable similarity in the blood chemistry in acute histamin intoxication and eclampsia, were interpreted as further evidence of the close resemblance between the two conditions, particularly, as of late a number of autopsies upon women dying after premature separation have been reported, in which the lesions in both liver and kidneys simulated those observed in eclamptic patients.

Investigation into the problem of acute histamin intoxication has of late been promoted by several workers. A. Hiller, J. La Barre and Zuntz showed that in dogs, following the intravenous administration of this drug, there occurred a definite fall in the plasma CO_2 and in the plasma hydrogen-ion concentration, a lowering of surface tension, hyperglycemia and an increase in lactic acid. Louros succeeded in producing peripheral necrosis in the liver by intravenous injections of histamin,—quite in harmony with the findings recorded in our series of experiments. In addition, the author claims to have isolated a comparatively considerable amount of histamin from fresh placentae obtained from eclamptic patients.

A recent observation made in our service may be quoted here. While operating upon a similar case as described above, I scooped out the abundant free fluid found in the abdominal cavity and tested it on a strip of virgin guinea-pig's uterus, and also on a strip of intestinal muscle. Evidence was obtained of the presence in the peritoneal exudate of a potent smooth-muscle stimulant. Although such response has recently come to be considered rather conclusive proof of the presence of histamin (see article by Forst and Weese), I am for the time being inclined to a more guarded interpretation.

Before leaving this subject, I wish to refer to a number of established principles which may throw some light on the subject of the relationship of both acute and prolonged histamin intoxication to certain ductless glands. It should be remembered in this connection that last year Dr. Geiling and I succeeded in accurately reproducing the characteristic hepatic and renal lesions as encountered in cases of pernicious vomiting by the administration of histamin to carnivora over a prolonged period; and as a most interesting point in our observations, the production of such changes could be prevented by the simultaneous administration of insulin. Evidence pointing to an acceleration of both secretion and output of adrenalin after the introduction into the blood stream of histamin and other protein-split-products has been advanced by Abderhalden, Dale, Steppuhn, Storm van Leeuwen and others. Moreover, these investigators have also found the arterioles to be in a state of higher tonicity and increased susceptibility to adrenalin under these circumstances. The bearing of such findings on the occurrence of elevation of blood pressure in toxemias is obvious.

The clinical application of the results of our experimental studies with regard to anesthesia and blood transfusion as integral parts in the treatment of severe cases of premature separation of the normally implanted placenta has been fully discussed last year in the paper referred to above.

REFERENCES

Dale, H. H.: Jour. of Physiol., lxi., No. 2. *Flexner and Noguchi:* Univ. Penn. Med. Bull., 1904, xvi. *Forst u. Weese:* Arch. f. Exper. Path. u. Pharmacol., 1926, cxvii, 232. *Franqué:* Deutsch. med. Wchschr., 1915, p. 902. *Hanzlik, P. J.:* Jour. of Pharmacol. and Exp. Therap., xxxiii; Jour. Am. Med. Assn., 1924, lxxxii, 2001; Arch. Inter. Med., 1925, p. 36. *Heidenhain:* Centralbl. f. Gynäk., 1921, No. 25. *Hofbauer:* Am. Jour. of Obst. and Gynec., 1926, xii, No. 2. *Hofbauer and Geiling:* Bull. of Johns Hopkins Hosp., Feb., 1926. *Storm van Leeuwen:* Arch. f. Exp. Pathol. u. Pharmacol., 1920, lxxxviii. *Steppuhn:* ibidem, 1926, cxii. *Storer, Malcolm:* Boston Med. and Surg. Jour., cxxvii, 377. *Thaler:* Centralbl. f. Gynäk., 1921, p. 578. *Williams, J. W.:* Surg. Gynec. and Obst., 1915, p. 541; Jour. Obst. and Gynec. Brit. Emp., 1925, xxxii. *Zweifel:* Monatschr. f. Geburtsh. u. Gynäk., xxxvi. *Abderhalden:* Pflüger Archiv, ccv; cciii. *Louros:* Arch. f. Gynaecol., cxxix, No. 2. *Hiller, A.:* Jour. of Biological Chem., lxiii. *LaBarre, J.:* Compt. rend. de la Soc. de Biol., xcv.

AMNIOTIC FLUID AS A POSSIBLE FACTOR IN THE ETIOLOGY OF ECLAMPSIA

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THE study of amniotic fluid as related to eclampsia appears to have been neglected in the study of the etiology of this disorder. No reference suggesting a causal relationship between the two has thus far been found in the literature available. Williams and Bargen,[22] however, who have studied the chemistry of amniotic fluid, state that the greater concentration of uric acid in amniotic fluid over that in the blood suggests that in the toxemias of pregnancy, the increased uric acid of the blood may arise in part from a more highly saturated amniotic fluid. No other reference which has associated amniotic fluid in any way with eclampsia has thus far been found.

The experimental work which forms the basis for this report was begun with the hope of determining what part amniotic fluid might be capable of playing in the production of eclampsia. Experiments were planned with the belief that the disease might be due to the sudden accidental injection of a considerable amount of amniotic fluid into the maternal blood stream. How such an accidental injection could take place can only be conjectured. It was felt, however, that a slight separation of the placental margin associated with a rent in the amniotic sac near the placental site, might open a channel of communication between the amniotic cavity and the uterine veins (such as is known to occur in certain types of "blood moles") and that uterine tonicity or contraction might then force amniotic fluid into the maternal circulation. The explanation of postpartum eclampsia on this basis might offer more difficulty. The assumption might be made, however, that amniotic fluid is retained in the uterine cavity, and that it finds entrance into the uterine veins at the placental site.

Such a theory of eclampsia could account for the suddenness of onset in women who have previously been apparently quite healthy. It might account for the benefit sometimes obtained for the eclamptic patient by an early emptying of the uterus. It might also explain why in other cases this procedure is ineffective, since the methods adopted to empty the uterus often block the cervical outlet and hold the amniotic fluid in the uterine cavity under pressure. It might explain the greater incidence of eclampsia among primigravidae, since lightening, by blocking the cervical canal early, may favor the chances for the introduction of amniotic fluid into the maternal blood stream. It might throw light on the clinical observations of Stevens[23] and of DeLee,[1] who state that in their experience rupturing the membranes alone is a most valuable procedure, and is often followed by the cessation of convulsions. Indeed, if this theory is correct, the procedure which Stevens advises—that of rupturing the membranes and draining off as much amniotic fluid as possible—would appear to be one of the first indications in the treatment of the disease. Entrance of additional amniotic fluid into the blood stream might thus be prevented. The exceedingly low mortality reported by Stroganoff[24] might be explained on this basis as due in part to his practice of rupturing the membranes.

The original belief with which the experiments were begun was that amniotic fluid might be found to be toxic, and that toxicity might be due to accumulation within the amniotic sac of products of fetal metabolism. That such an accumulation could take place would seem to be indicated by the work of Williams and Bargen.[22] As a prelim-

TABLE I. THE EFFECT UPON THE FEMALE RABBIT OF

DATE OF INJECTION	RABBIT INJECTED			AMMIOTIC FLUID USED		
	NO.	WT. IN KG.	CONDITION	SOURCE	PREPARATION	MICROSCOPIC EXAMINATION OF THE FLUID INJECTED
Aug. 5	1	1.2	Not pregnant.	Rabbit A. Estimated full term, Aug. 8.	Fluid centrifuged. Supernatant fluid injected.	Not made.
Aug. 19	2	1.1	Not pregnant.	9B Estimated full term, Aug. 23.	Centrifuged. Clear supernatant fluid used.	Not made.
Aug. 23	3	1.1	Not pregnant.	C. Estimated full term, Aug. 25.	Gross particles removed by sedimentation.	Solitary red cells fairly numerous. An occasional squamous epithelial cell seen. Fluid isotonic for red cells.
Aug. 23	4	1.1	Not pregnant.	C.	Sediment from fluid given No. 3 suspended in 6 c.c. of salt sol. Grosser particles removed by sedimentation.	Many solitary squamous epithelial cells and many solitary red cells present.
Sept. 4	5	1.1	Not pregnant.	D. Primipara. Due Sept. 5.	Gross particles removed by sedimentation.	Many large solitary epithelial cells and many solitary red cells present.
Sept. 23	6E	3.0	A few hours after delivery by cesarean section.	6 E 1. Due Sept. 26 Pooled fluid of normal young	Gross particles removed by sedimentation.	Solitary red cells and a fairly large number of squamous epithelial cells, mostly solitary, but some in small clumps.
Sept. 23	7	1.2	Not pregnant. (first injection)	6 E 1.	Centrifuged. Clear supernatant fluid used.	No cells or other formed elements found.

INTRAVENOUS INJECTION OF AMNIOTIC FLUID OF THE RABBIT

HEMAGGLUTININS		DOSAGE AND METHOD OF INJECTION	EFFECT	POSTMORTEM FINDINGS
AMNIOTIC FLUID PLUS RED CELLS OF ANIMAL INJECTED	SERUM OF ANIMAL INJECTED PLUS RED CELLS MIXED WITH AMNIOTIC FLUID			
Not tested.	Not tested.	8 c.c. in a vein of the ear.	Convulsions within 5 min. and death within 10 min. after injection.	Rabbit 1. Small hemorrhages in the thymus, the lung margins, and in the right kidney.
Not tested.	Not tested.	2 c.c. in vein of ear. Repeated after 22 min. with 4 c.c. into heart, and after another 40 min. with 8 c.c. into the heart.	No appreciable effect.	
Not tested.	Not tested.	7 c.c. in vein of ear.	No appreciable effect.	
Not tested.	Not tested.	6 c.c. in vein of ear.	No appreciable effect.	
Not tested.	Not tested.	1 c.c. (total yield of D) in vein of ear.	No appreciable effect.	
Negative.	Not tested.	10 c.c. in vein of ear.	Convulsive seizure within 3 min., lasting 1 min. Death, after gasping respiration, within 5 min.	Rabbit 6 E. Multiple small hemorrhages in the lungs, and a few small hemorrhages in the atrophic thymus. Moderate active hyperemia of the leptomeninges of the brain Marked active hyperemia of both kidneys. Chronic nephritis (pitting of kidney surfaces with scarring of many glomeruli and with small retention cysts in the cortex).
Negative.	Not tested.	9 c.c. in vein of ear.	No appreciable effect.	

TABLE I

DATE OF INJECTION	RABBIT INJECTED			AMNIOTIC FLUID USED		
	NO.	WT. IN KG.	CONDITION	SOURCE	PREPARATION	MICROSCOPIC EXAMINATION OF THE FLUID INJECTED
			Second injection, 2½ hr. after the first.	6 E 1.	Sediment from fluid of first injection suspended in salt solution. Grosser particles removed by sedimentation.	Many solitary red cells, and many squamous epithelial cells of which some were solitary and some in small clumps.
Sept. 23	3	1.6	Not pregnant. Previous injection Aug. 23.	6 E 1.	Centrifuged. Clear supernatant fluid used.	Negative.
Sept. 23	8	1.0	Not pregnant.	6 E 1.	Grosser particles removed by sedimentation.	Many solitary red cells. A few epithelial cells, some in clumps.
Sept. 24	2	1.5	Not pregnant. Previous injection, Aug. 19.	6 E 2. Pooled fluid of two fetuses dead for sometime in utero.	Grosser particles removed by sedimentation. (Specimen free from accidental admixture of blood.)	Degenerated epithelial cells. A few crystals and much fine amorphous débris. (Grossly the fluid had a chocolate color due to old blood.)
Sept. 27	9B	2.9	Pregnant. Due to deliver Oct. 4.	F. Due Sept. 27.	Centrifuged. Clear supernatant fluid used.	An occasional solitary red cell.
Sept. 27	5	1.6	Not pregnant. Previous injection Sept. 4.	F.	Centrifuged. Clear supernatant fluid used.	An occasional solitary red cell.
Oct. 2	10	3.4	Pregnant. Due to deliver Oct. 22.	9 B Due Oct. 4. (Second cesarean)	Diluted with salt solution and centrifuged until clear. (Specimen was entirely free from blood.)	Negative.

inary experiment to test this theory, amniotic fluid was collected from a pregnant rabbit near term, by means of a cesarean section. Since the fluid thus collected contained a small admixture of blood, it was centrifuged. A dose of 8 c.c. of the supernatant fluid was then injected into the marginal vein of the ear of a young female rabbit. Within five minutes following the injection, the rabbit had a violent convulsive seizure, and within ten minutes it had expired.

With this encouragement, the investigation was continued. Amniotic fluid was obtained in a similar manner from a gravid guinea pig, and as it also contained a slight admixture of blood, it was centrifuged. Two other guinea pigs were anesthetized, and just preceding their awakening, the fluid was injected directly into their hearts. One received a dose of 2.5 c.c. and the other 6 c.c. Neither showed any ill effects other than a short period of shivering. The fluid from another

—Cont'd.

HEMAGGLUTININS		DOSAGE AND METHOD OF INJECTION	EFFECT	POSTMORTEM FINDINGS
AMNIOTIC FLUID PLUS RED CELLS OF ANIMAL INJECTED	SERUM OF ANIMAL INJECTED PLUS RED CELLS MIXED WITH AMNIOTIC FLUID			
	Not tested.	8 c.c. in vein of ear.	No appreciable effect.	
Negative.	Not tested.	5 c.c. in vein of ear.	No appreciable effect.	
Negative.	Not tested.	5 c.c. in vein of ear.	No appreciable effect.	
Negative.	No blood cells present.	2.5 c.c. in vein of ear.	Death within a few minutes, after short convulsive seizure and gasping respiration.	Rabbit 2. Multiple small hemorrhages in the lungs and in the thymus. Multiple parasitic cysts in the liver.
Negative.	Negative	5 c.c. in vein of ear.	No appreciable effect.	
Negative.	Negative.	3 c.c. in vein of ear.	No appreciable effect.	
Not tested.	No blood cells present.	1 c.c. in salt sol. in vein of ear. (Total yield of Rabbit 9 B.)	No appreciable effect.	

rabbit, prepared like the first, was then injected into the blood stream of a second rabbit. The result of this injection was entirely negative.

The scope of the experiments was then broadened to include a study of the solid elements in amniotic fluid; and as the investigation proceeded, a consideration of its antibody content was also undertaken.

The results obtained in this series of experiments are summarized in Table I. Specimens of amniotic fluid were obtained at seven cesarean sections upon pregnant rabbits each near full term. Ether anesthesia was used. The fluid of all normal young delivered at any cesarean was pooled. In one instance a second specimen was prepared by mixing the fluids of two fetuses which had apparently been dead for some time in utero. One abnormal and seven normal fluids, therefore, were examined. (In only two instances were fluids obtained entirely free from any admixture of blood, the amount, however, usually being small.) Injections were made into the marginal veins of the ears of ten female rabbits. One rabbit received also two injections directly into the heart. A few of the rabbits received a second intravenous injection. The effects of fourteen preparations were thus tested. Seven animals received amniotic fluid centrifuged until clear. One of the seven died as a result of the injection. Seven received preparations which had not been centrifuged. Some of these preparations were specimens of amniotic fluid from which any blood clots present had been removed by sedimentation. Others were suspensions in salt solution of the sediment from amniotic fluid from which blood clots had been removed. By microscopic examination these preparations were seen to contain, in addition to solitary red cells, a varying number of large epithelial cells, of which some were solitary and some in small clumps. Two of the seven animals receiving these preparations died. Seven of the ten rabbits were presumably not pregnant at the time of injection, and all of the seven were young animals that probably never had been pregnant. Two of those that died were from this group of seven, and at autopsy upon the two, no evidence of pregnancy was found in either. Two animals were pregnant at the time of injection, but in neither were ill effects observed. One was injected a few hours after it had been delivered by cesarean section. It was one of the group that died as a result of injection. Its death, however, was probably due to pulmonary embolism. There does not appear to be any special factor in pregnancy, therefore, which sensitizes the rabbit toward amniotic fluid. Three animals received a second injection a few weeks after having had the opportunity to become sensitized by the first. One of these was included among those that died. Its death, however, appeared to be due not to anaphylaxis, but to embolism; and since the other two showed no ill effects, anaphylaxis probably played no part in the production of symptoms in any. Agglutination of red cells likewise probably played no part in the production of symptoms, since hemagglutinins were not found in any fluid tested.

In only three of the ten animals were any symptoms noted. (No study was made, however, of the effects of the injections upon the blood pressure or upon the urine.) The three showing ill effects all died. The symptoms in all were similar. Each had a short convulsive seizure, occurring soon after injection, followed by death. In Rabbit 1, however, the convulsion was a little later in appearing than in the other two. Its convulsion also was more violent, and was followed apparently by a short period of coma. The convulsive seizures in the other two were followed by gasping respiration, and suggested the struggle of asphyxia.

The pathologic findings in the three that died were quite similar. All had multiple small hemorrhages in the lungs and in various other organs. The brain in each was free from hemorrhage. Hemorrhages in two were especially numerous in the thymus. One had hemorrhages in one kidney. Both kidneys of another were markedly hyperemic, but appeared to be free from hemorrhage. In the kidneys of the third, no abnormality was noted. Hemorrhages in the liver were not identified in any, but by reason of the vascular nature of this organ, might easily have been overlooked. Serial sections were not made.

As to the cause of death—Rabbit 1 received the supernatant fluid of a centrifuged specimen, presumably free from emboli. It was not pregnant, and had had no previous injection to sensitize it; hence anaphylaxis seems improbable. For reasons previously mentioned, hemagglutinins probably played no part in its death. Presumably, therefore, death may have been due to some highly toxic substance in the fluid injected. By reason of insufficient amount of the specimen, adequate controls could not be made. The second animal (Rabbit 6E) received amniotic fluid which contained many large epithelial cells. Its death was apparently due to embolism resulting from these cells. That death was not due to any toxicity of the fluid injected is shown by the *fact* that three other rabbits (Nos. 7, 3 and 8) received injections of the same fluid with no ill effect. The third animal (Rabbit 2) had had a previous injection; the fluid injected was *not a normal fluid;* and it contained clumps of epithelial cells which could act as emboli. Several factors, therefore, might have played a part in producing death. The symptoms and the postmortem findings, however, would seem to indicate that death was due to pulmonary embolism. Since the symptoms and the pathology in the three fatal cases were so similar, and since no fluid where adequate controls were possible was found to be toxic, the question arises as to whether the first death may not also have been due to embolism—resulting perhaps from a few epithelial cells which may have remained in suspension. Unfortunately, no microscopic examination of the fluid injected into this animal was made.

For the study of human amniotic fluid only one suitable specimen has thus far been available. This was obtained by rupturing the membranes at the vulva. A considerable amount was thus collected, but through a mishap later, all but about one c.c. was lost. This fluid was entirely free from blood. Suspended in it were many white particles resembling curds of cottage cheese. These by microscopic examination were seen to be composed largely of clumps of epithelial cells. A dilution in salt solution to a volume of about 5 c.c. was made with the fluid saved, and the coarse particles were removed by sedimentation. The supernatant fluid then separated was seen when examined microscopically to contain many epithelial cells, some singly and some in small clumps. It contained also much unidentified debris, and many oil globules. The latter varied in size up to about twice the diameter of a human leucocyte, and came presumably from the vernix caseosa. A dose of 4.5 c.c. of this fluid was injected into the marginal vein of the ear of a young male rabbit. The injection had no ill effect. Had the original fluid without sedimentation been injected, however, death from pulmonary embolism would almost surely have occurred. That death did not result was evidently due to a fortunate localization of the emboli known to have been present.

By reason of lack of human amniotic fluid for further study, this paper is presented, incomplete as it is, with the hope that further investigation will be stimulated where the necessary clinical material is available. It is evident that the investigation should include a study not only of the substances dissolved in amniotic fluid, and its antibody content but also of the solids in suspension. Furthermore, animals of larger size than rabbits probably should be used, since emboli of a size such that they might block the pulmonary vessels of the rabbit, might possibly pass through the lungs of the adult human being and lodge in other organs.

It is interesting in this connection to note that DeLee, in describing the pathology of eclampsia,[1] remarks that thrombi and emboli are very common in the lungs, liver, kidneys, brain, and skin, and that they consist of liver-cells, endothelium, and syncytium—the last mentioned having no significance, as it may be found in normal puerperae. He states furthermore that in the small thromboses and emboli which are constant findings in the lungs, decidual cells and fat may be found, as well as cells of the type above mentioned. Is it possible that the "liver-cells and endothelium" may be in reality cells from the skin of the fetus and from the lining of the amniotic sac, and that the emboli of fat in the lungs may come from the vernix caseosa?

SUMMARY

1. In a series of ten female rabbits given intravenous injections of preparations of amniotic fluid of the rabbit, three had convulsive seizures and died. The others developed no symptoms recognizable by

observation. The death of two of the animals appeared to be due to pulmonary embolism resulting from epithelial cells contained in the fluid injected. The other animal received fluid presumably free from emboli. The cause of its death remains undetermined.

2. Human amniotic fluid may contain abundance of material which, if injected into the blood stream, could produce embolism.

3. The theory is suggested that eclampsia may be due to the sudden accidental injection of a considerable amount of amniotic fluid into the maternal blood stream.

REFERENCES

(1) *DeLee, Joseph B.:* The Principles and Practice of Obstetrics, ed. 4, Philadelphia, W. B. Saunders Company, 1925, pp. 376-395. (2) *Williams, J. Whitridge:* Obstetrics, ed. 4, New York, D. Appleton and Co., 1921, pp. 579-598. (3) *Elwyn, H.:* Am. Jour. Obst. and Gynec., Nov., 1925, x, 698. (4) *Kane, H. F.:* Surg. Gynec. and Obst., April, 1926, xlii, 569. (5) *Fitz Gibbon, G.:* Jour. Obst. and Gynec. Brit. Emp., 1922, xxix, 402. (6) *Solomons, B.:* Jour. Obst. and Gynec. Brit. Emp., 1922, xxix, 416. (7) *Carey, E.:* Surg., Gynec. and Obst., Aug., 1925, xli, 194. (8) *Eden, T. W.:* Jour. Obst. and Gynec. Brit. Emp., 1922, xxix, 386. (9) *Dienst, A:* Monatschr. f. Geburtsh., u. Gynäk., July, 1926, lxxiv, 1. Abstract, Jour. Am. Med. Assn., Oct. 9, 1926, lxxxvii, 1250. (10) *Louros, N.:* Zentralbl. f. Gynäk., May 29, 1926, l, 1425-1488. Abstract, Jour. Am. Med. Assn., Aug. 7, 1926, lxxxvii, 453. (11) *Lawrance, J. S.:* Am. Jour. Obst. and Gynec., Mar., 1925, ix, 351. (12) *Hofbauer, J.:* Am. Jour. Obst. and Gynec., Aug., 1926, xii, 159. (13) *Miller, J. C.:* Am. Jour. Obst. and Gynec., June, 1926, xi, 763. (14) *Polak, J. O.:* Jour. Am. Med. Assn., July 24, 1926, lxxxvii, 227. (15) *Hynd, A.:* Lancet, Oct. 31, 1925, ccix, 910. (16) Med. Sc., Sept., 1921, iv, 537-546. (17) *Stander, H. J., and Radelet, A. H.:* Bull. Johns Hopkins Hosp., June, 1926, xxxviii, 423. (18) Jour. Am. Med. Assn., Aug. 28, 1926, lxxxvii, pp. 715, 1081. (19) *Ottenberg, R.:* Jour. Am. Med. Assn., July 28, 1923, lxxxi, 295. (20) *Gruhzit, O. M.:* Am. Jour. Obst. and Gynec., May, 1924, vii, 588. (21) *Oden, C. L. A.:* Jour. Mich. Med. Soc., Feb., 1925, xxiv, 110. (22) *Williams, J. L., and Bargen, J. A.:* Am. Jour. Obst. and Gynec., April, 1924, vii, 406. (23) *Stevens, T. G.:* Jour. Obst. and Gynec. Brit. Emp., 1922, xxix, 426. (24) *Stroganoff, B.:* Am. Jour. Obst. and Gynec., June, 1926, xi, 756.

LIVER FUNCTION IN PREGNANCY

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PHENOLTETRACHLORPHTHALEIN was shown to be nontoxic and almost entirely excreted by the liver by the studies of Abel and Rowntree. This led Rowntree,[1] Hurwitz and Bloomfield; and Whipple, Mason and Peightal to determine liver function by calculating the amount of the dye found in the twenty-four-hour stool collection. McNeil introduced the method of determining the appearance time of the dye by bile drainage. Finally Rosenthal popularized the use of phenoltetrachlorphthalein as a liver function test by the blood serum method.

Rosenthal[2] showed experimentally that when the liver is damaged or when 10 per cent or more of the liver is removed,[2] the dye is recovered in the serum at the end of certain intervals and in proportion to the damage of the liver. He found clinically[4] that in a number of diseases in which the liver is damaged there is retention of the dye in the blood serum beyond the normal limits. These same findings were confirmed by Ottenberg, Rosenfeld and Goldsmith[5]; Levin-Ryney D'Amory[6]; Boardman and Schoonmaker[7]; Bull and Bauman[8]; Wm. J. Mayo[9]; Rowntree[10]; Shattuck[11]; and a host of other workers.

Considerable objection has been raised to the use of phenoltetrachlorphthalein because of its dangers. Maurer and Gatewood[12] pointed out that the dye was toxic. Rosenau[13] reviewed the literature and reported the dangers of the halogenated phthaleins as a function test to be thrombosis, frequent, local reactions at sight of injection, chills, or death.

Other symptoms were dryness, pain over liver region, purgation, possible strain on damaged liver as shown by increased hyperbilirubinemia.

To overcome these objections Rosenthal and White[14] introduced bromsulphalein (phenoltetrabromphthalein sodium sulphonate). Rosenthal experimentally[15] and clinically[10, 11] proved that bromsulphalein eliminated the dangers of phenoltetrachlorphthalein and claims that it is excreted in the bile of rabbits (85 per cent) in one hour, is rapidly removed by the liver, remains in blood stream *in toto* with extirpation of the liver, only appears in traces or not at all in urine of normal animals, greater concentration and thus smaller dose necessary (dose 2 mg. per kg. of body weight), nonirritating to vein walls in small doses and given in concentrated form, more sensitive to liver injury, and technic simpler.

My interest in bromsulphalein has been to determine its value in the testing of liver function in pregnancy and its toxemias. Already a number of investigators have used phenoltetrachlorphthalein or bromsulphalein in liver function of pregnancy. Levin-Ryney D'Amory[6] reports marked retention for over three hours of phenoltetrachlorphthalein in a case of hyperemesis gravidarum. Trainor[17] using the same drug records two cases of postpartum eclampsia with retention. Rosenfeld and Schneiders found normal elimination of the same dye in six normal cases; they believe it to be of value in differentiating neurotic from toxic vomiting of pregnancy; and they found liver function impairment in nine cases of preeclamptic toxemia. Krebs and Dieckman[20] employing the same dye add that they believe it is a good aid in differentiating renal from hepatic toxemia. Smith[21] also using phenoltetrachlorphthalein in 44 cases of toxemia, concludes that retention means preeclamptic toxemia, whereas a normal test may indicate chronic nephritis. King[22] employing bromsulphalein, agrees with the findings of the other authors.

The technic I employed was that of Rosenthal,[14] using bromsulphalein. For each 55 pounds of body weight 1 c.c. of a 5 per cent

TABLE I. HYPERTENSION WITH RETENTION OF BROMSULPHALEIN

NO.	DATE	B. P.	URINE	SYMPTOMS	TEST	COMMENT
5	4/ 9/26	108/68	No specimen	Frontal headaches and edema of feet and ankles	0	Protein free diet, etc.
	5/14/26	138/90	Negative		2·3%	
10	4/13/26	138/80	No specimen	Nausea	Very faint trace	Protein free diet, etc.
	7/ 6/26	130/80	Negative			
	8/ 3/26	120/60	Negative			
12	4/15/26	150/80	No specimen	Frontal headaches and edema of feet and ankles	Faint trace	Protein free diet, etc.
	7/22/26	120/70	Negative			
14	4/15/26	140/75	No specimen	Edema of legs and constipation.	Faint trace	
	5/20/26	150/90	Negative		5%	
	7/ 8/26	122/70	Negative	Pain in abdomen	4%	
32	4/29/26	140/85	No specimen	None	5%	
	5/27/26	140/100	Negative		5%	Protein free diet, etc.
36	4/29/26	132/75	No specimen	Nausea, headaches and nosebleed	5%	Protein free diet, etc.
	7/29/26	120/72	Negative	None	Faint trace	
37	4/30/26	148/96	No specimen	Frontal headaches, edema of feet and ankles	Trace	Protein free diet, etc. Test repeated twice again but patient left clinic before end of half hour.
	6/14/26	140/80	Negative	Headaches and vertigo.		
	7/ 9/26	140/72	Negative			
45	5/ 3/26	150/90	No specimen	Slight headaches	3 to 4% (52 min.)	Protein free diet, etc.
	6/ 1/26	140/90	Albumin—faint trace		3%	
	6/ 8/26	140/85				
46	5/ 3/26	140/80	No specimen	Edema of feet and ankles	3·4%	
	6/ 1/26	115/70	Negative		3%	

All cases delivered normally unless otherwise noted.

TABLE I—CONT'D

NO.	DATE	B. P.	URINE	SYMPTOMS	TEST	COMMENT
52	5/ 6/26	145/90	No specimen	Constipation	Trace	Protein free diet, etc.
	6/17/26	135/85	Negative	None		
	7/ 1/26	130/90	Negative	None		
53	5/ 6/26	140/85	No specimen	None	0	Protein free diet, etc.
	5/20/26	150/90	Negative		Trace	Broke diet
	6/24/26	155/80	Negative		1%	Broke diet
	7/29/26	150/82	Negative		1-2%	Broke diet
56	5/ 7/26	150/100	No specimen	Slight edema	Trace	Protein free diet, etc.
	5/14/26	156/92	Albumin +			
61	5/11/26	150/76	No specimen	Nausea, slight edema and frontal headache	Very faint trace	Protein free diet, etc.
	6/15/26	144/85	Negative			
62	5/11/26	140/70	No specimen	Nose bleed and edema of feet	Very faint trace	
	5/26/26	125/75	Negative			
63	5/11/26	190/120	No specimen	Nausea, slight headache	Very faint trace	Protein free diet, etc.
	7/20/26	170/120	Negative	None	Faint trace	
	8/ 3/26	194/130	Albumin +	Edema	4%	
70	5/11/26	134/68	No specimen	None	0	
	6/ 8/26	160/90	Negative	None	0	
	8/10/26	160/90	Albumin +		Very faint trace	
	8/17/26	150/95	Albumin +	Edema	2%	
72	5/14/26	140/84	No specimen	Nausea, headache, edema of feet and ankles and nose bleed		Left clinic
74	5/18/26	134/70	No specimen	Nausea, headache and edema	Trace	
	7/20/26	104/66	No specimen		Trace	
84	5/20/26	140/100	No specimen	Frontal headache, constipation and slight edema	0	Protein free diet, etc.
	6/17/26	160/105	Negative		1-2%	6/29/26—33 wk. spontaneous delivery

TABLE I—CONT'D

NO.	DATE	B. P.	URINE	SYMPTOMS	TEST	COMMENT
85	5/25/26	145/80	No specimen	Nausea, constipation and edema	3%	Protein free diet, etc.
86	5/25/26	162/90	No specimen	Nausea and edema of feet	Very faint trace	Protein free diet, etc.
	6/ 8/26	160/100			1-2%	Eight weeks postpartum.
	8/19/26	134/78	Negative		0	
90	5/28/26	130/75	No specimen	Nausea and headache	Trace	Protein free diet, etc.
	6/25/26	152/80	Negative	Frontal headache	Very faint trace	
91	5/28/26	135/80	No specimen	Slight edema	Trace	
	6/11/26	138/90	Negative			
92	5/28/26	135/85	No specimen	Nausea, headaches and slight edema	Trace	
	6/11/26	140/90	Albumin—trace		Very faint trace	
	7/22/26	135/90			Trace	7/20/26 patient admitted to hospital with B. P. 190/130 at 7 P.M. at 8 P.M. delivered of twins. B. P. dropped to 155/130. Two hours later P. P. hemorrhage, 500 c.c.
98	6/ 1/26	130/80	No specimen	Headache and edema of feet and ankles	4+%	Protein free diet, etc.
	6/29/26	140/85	Negative		2-3%	Left clinic
110	6/10/26	130/80	No specimen	Headache and constipation	3%	
	7/20/26	118/80	Negative	None	1-2%	Left clinic
111	6/10/26	160/100	No specimen	None	Very faint trace	Protein free diet, etc.
	8/ 5/26	160/90	Negative		0	Previous pregnancy in 1922. B. P. systolic 150-134-162
113	6/15/26	130/70	No specimen	Headache and slight edema	3%	Protein free diet, etc.
	7/13/26	140/90	Negative		1-2%	Three weeks postpartum.
	9/ 2/26				0	

TABLE I—CONT'D

NO.	DATE	B. P.	URINE	SYMPTOMS	TEST	COMMENT
119	6/15/26	136/70	No specimen	Headache and slight edema	1-2%	
	8/17/26	130/70	Negative	None	1%	
	8/31/26	120/70	Negative			9/17/26 low forceps
121	6/17/26	145/85	No specimen	Headache and slight edema	1%	Protein free diet, etc.
	7/ 1/26	120/82				
124	6/18/26	160/105	No specimen	Nose bleed and headaches	Faint trace	Protein free diet, etc.
	7/ 2/26	132/90				
125	6/18/26	130/75	No specimen	Edema of feet and ankles	Faint trace	
	7/16/26	115/78				Case dropped
126	6/18/26	130/90	No specimen	None	3%	Protein free diet, etc. Left city
127	6/18/26	130/86	No specimen	Headache and slight edema	Very faint trace	Left city
131	6/24/26	130/80	No specimen	None	2%	7/8/26 protein free diet
	7/22/26	125/80	Negative		1-2%	9/2/26 full term asphyxiate fetus
132	6/24/26	225/90	Albumin—trace	Headache	4%	
134	6/25/26	120/80	No specimen	None	1%	
	7/ 9/26	132/90	Negative	Constant abdominal pain	0	
159	7/ 6/26	160/108	No specimen	Nausea and headaches	Trace	Protein free diet, etc.
	8/ 3/26	130/85	No specimen	None	0	Not pregnant
165	7/13/26	180/130	No specimen	Headache, edema of feet and ankles and constipation	3%	Protein free diet, etc.
166	7/16/26	160/75	No specimen	Slight headache, edema of feet and ankles and nosebleed	Very faint trace	Protein free diet, etc.
	8/ 6/26	138/70	Negative	Frontal headache and edema		
101	6/ 4/26	130/74	No specimen	None	2%	Left clinic
67	5/11/26	125/70	No specimen	Nausea, frontal headaches and constipation	0	
	7/20/26	130/60	Negative	None	1%	
	8/ 3/26	120/76	Negative	None		

Table II. Apparently Normal Cases With Evidence of Retention

DATE	B. P.	URINE	SYMPTOMS	TEST	COMMENT
4/10/26 4/21/26	120/70 125/75	No specimen	Frontal headaches	Very faint trace	
5/11/26	118/74	No specimen	Frontal headaches, constipation and dizziness	Very faint trace	5/27/26 Not pregnant Prob. fibrosis uterus
5/18/26 6/ 1/26 8/12/26	120/62 124/70	No specimen	Nausea, headaches and edema	3%	Eight weeks postpartum
5/18/26	116/60	No specimen	Nausea, headaches, constipa- and edema of feet and ankles. Also choking sensation	2%	
5/25/26 7/19/26	120/65 110/60	Albumin +			
5/20/26 7/ 1/26	110/60 108/68	No specimen Negative	None	Faint trace	
6/ 1/26	108/66	No specimen	None	2%	Left clinic
6/ 1/26	126/80	No specimen	Nausea, headaches and edema	2-3%	
6/ 4/26	112/76	No specimen	None	Very faint trace	

TABLE II—CONT'D

DATE	B. P.	URINE	SYMPTOMS	TEST	COMMENT
6/11/26	120/80	No specimen	Constipation	Trace	
7/30/26	113/58	Negative			8/ 2/26 Dead fetus 36 wk.
6/25/26	124/80	No specimen	Nausea and headaches	2%	
7/11/26	122/78	No specimen	None	2%	
7/ 8/26	124/75	No specimen	Constipation	Very faint trace	
7/ 8/26	120/80	No specimen	None	1-2%	
8/ 5/26	120/70				
4/30/26	124/80	No specimen	Frontal headache	Faint trace	
8/27/26	110/70	Negative	None		
5/11/26	118/64	No specimen	Nausea, headaches and constipation	Very faint trace	
7/20/26	100/60	Albumin +	None	0	
8/ 3/26	100/65	Negative			
5/18/26	130/80	No specimen	Nausea, headache and edema Also pain in back	Trace	
8/17/26	130/80	Negative		Trace	8/21/26 Normal delivery
6/10/26	105/60	No specimen	None		
9/ 2/26	115/75	Negative		2-3%	9/18/26 Normal delivery
6/11/26	112/60	No specimen	Nausea and constipation	2%	
10/ 1/26	110/70	Negative			10/ 9/26 Normal delivery

solution of bromsulphalein in sterile ampules[*] was injected into the vein of one arm; at the end of one-half hour a sample of blood was withdrawn from the vein of the opposite arm. The serum obtained was matched with standards[†] already prepared. In the case of hemolysis or cloudy serum the use of acetone to clear the serum recommended by Bloom and Rosenau[16] was found to be effective.

The test was given to patients of the Obstetric Clinic of the University Hospital at their first appearance regardless of blood pressure and symptoms. These patients were watched until delivery. When their blood pressure rose, or when after being under treatment and their symptoms either improved or became worse, the test was repeated. This plan was followed whenever possible with the hope that the liver function test might show interesting findings.

A total of 174 patients received the bromsulphalein, and a total of 215 injections was given. No reactions immediate or delayed, local or systemic, and no thrombosis developed. In three cases where the dye was injected into the surrounding tissue or leaked out of the vein local fibrosis was produced. These findings lead me to believe that bromsulphalein is absolutely safe in the doses employed. King also using the same dose found the same to be true.[‡]

Sixty-two cases have been followed from the time they first entered the clinic until they were discharged as delivered or left clinic before delivery, or were not pregnant. All these cases were normal and showed normal elimination at the end of one-half hour and through the entire pregnancy did not show any abnormal rise in blood pressure. Two of these cases were not pregnant and four left the clinic before delivery.

There were twenty-six cases of hypertension with normal elimination of bromsulphalein. The highest systolic B.P. was 175, while 21 cases started with systolic B.P. 130-140; 2 cases B.P. 140-150; 1 case 150-160; 2 cases 170-180. All cases responded to the routine treatment of low protein diet, magnesium sulphate and forced water, 16 cases returning to normal B.P. and the others had their B.P. materially lowered. One case in this group proved to be epilepsy. One case not pregnant, 3 cases left clinic before delivery, and the rest all had normal deliveries. It is difficult to interpret these results. It perhaps does point to the fact that B.P. is not a true index to the degree of toxemia; that this is perhaps a group of very mild cases, which apparently show no liver damage and react well to the routine treatment. This group perhaps indicate a favorable prognosis, although the physician must treat them as potential preeclamptic toxemias.

Table I includes 42 cases with hypertension and with varying de-

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[*] Bromsulphalein in ampules from Hynson, Westcott and Dunning.

[†] Artificial Standards prepared by Hynson, Westcott and Dunning.

[‡] Personal communication.

TABLE III. HYPERTENSION WITHOUT RETENTION OF BROMSULPHALEIN (NEPHRITIC)

DATE	B.P.	URINE	SYMPTOMS	COMMENT
4/15/26	120/ 85	No specimen	Nausea and headache	
4/24/26	140/ 85			
5/13/26	134/ 85	Albumin-trace		
6/11/26	170/ 90		Headache	Not pregnant.
4/16/26	210/120	No specimen	Slight headache, edema of feet and ankles	Protein free diet, etc.
4/30/26	200/126	Negative		
5/ 3/26	200/120	Negative	Headache and slight edema	Protein free diet, etc.
5/18/26	210/120	Negative		Extravenous injection of dye.
5/18/26	190/100	No specimen	Nausea and headache	Previous pregnancy interrupted at 36 weeks for nephritic toxemia. 5/20/26 delivered 15 wk. fetus.
6/15/26	180/140	No specimen	Nausea, headache, nosebleed, and edema	7/15/26 pregnancy interrupted for nephritic toxemia.
6/18/26	180/130	Albumin ++	Headache and edema of feet	

TABLE IV. HYPEREMESIS GRAVIDARUM

DATE	GEST.	B.P.	URINE	SYMPTOMS	TEST	COMMENT
5/25/26	8 wks.	110/60	5/22 Albumin negative Acetone ++++ Diacetic trace	Persistent vomiting.	1%	5/19/26 pregnancy interrupted. When test was done patient was taking food. Previous pregnancy interrupted for same cause.
7/ 1/26	12 wks.	108/70	No specimen	Persistent vomiting, weakness and constipation.	Trace	Patient recovered under treatment.

TABLE V. VOMITING

AUTHOR	TEST	NO. NEUROTIC CASES	NO. TOXIC CASES
Krebs and	Neg.	1	
Dieckman	Pos.		1
Rosenfield and	Neg	2	
Schneiders	Pos.		5
E. L. King	Pos.		3
Total		3	9

TABLE VI. ECLAMPSIA

DATE	GEST.	B. P.	URINE	SYMPTOMS	TEST	COMMENT
8/17/26	2 days P. P.	140 /82	8/15 Albumin +++ Acetone + Diacetic-trace Casts + R. B. C. +++		Trace	8/15/26 patient had 6 convulsions before admission to hospital, 4 convulsions after admission. B. P. on admission 154/120. Patient received 3 doses 20 c.c. Mg. sulphate 20 per cent. Intravenous. Venesection 950 c.c. Recovered.
8/19/26	37 wk.	142/ 90	Albumin +++ Casts—many granular		1 %	Patient had 7 convulsions before admission, 5 convulsions after admission. Received 4 doses 20 c.c. Mg. sulphate 20 per cent intravenous. High colonic irrigation, morphia. Test performed after first dose of Mg. sulphate. N. P. N. 26 mg. Recovered.
8/20/26	Intrapartum	120/ 88	Bloody		Trace	Patient admitted 8/20/26, 2:50 A.M. She received 2 doses 20 c.c. Mg. sulphate 20 per cent intravenous. Test done at 11:20 A.M. 7 convulsions. Patient recovered.
8/27/26	32 wk.	205/140	8/24 Albumin++++ Casts—few	Headache, blurred vision and generalized edema. No convulsions.	1·2%	Patient admitted to Med. General Hospital. B. P. 180/125. P. S. P. 48 per cent first hour. Blood urea 30 mg. Cesarean section 8/25/26. 8 months' fetus—lived.
9/ 7/26	34 wk.	160/110	9/6 Albumin ++ Casts—occasional	Headache, blurred vision and edema of feet and ankles.	2·3%	Admitted to hospital 9/14/26. B. P. 140/105 and given 1 dose 20 c.c. Mg. sulphate 20 per cent. 9/6/26 B. P. 170/116. Venesection 500 c.c. 9/8/26 spontaneous delivery—live child. Recovered.
10/ 8/26	Term	170/114	10/10 Negative		3 %	Patient admitted with convulsions—3 in number. Delivered of twins, first, low forceps, second, version. 1 postpartum convulsion. Venesection 500 c.c. Both twins died. Patient recovered.

All deliveries normal or otherwise noted.

grees of liver involvement as indicated by retention of bromsulphalein. Three cases started with normal blood pressure and negative test, but subsequently the blood pressure rose and evidence of liver impairment was found. (Cases 5, 70, and 67.) Nine cases (36, 45, 46, 110, 111, 159, 14, 131, and 119) showed improvement of liver function under treatment. Nine cases showed increase in liver damage with elevation of blood pressure (5, 14, 32, 53, 63, 70, 84, 86, and 87). One case (74) with lowering of blood pressure showed no improvement of liver function. Four cases (90, 98, 118, and 134) showed decrease in retention of bromsulphalein despite rise in blood pressure. This group of cases seems to again point to the fact that blood pressure is not a true guide as to the degree of liver function impairment; that liver function test is perhaps a better aid than blood pressure as to the condition of patient and response to treatment; and that it perhaps grades the type and severity of the toxemia and thereby may be a valuable aid as to prognosis and need for surgical interference.

Table II includes 17 cases with normal blood pressure and with evidence of liver function impairment. Twelve of these cases had symptoms. None of the cases subsequently showed increased blood pressure. Perhaps one may gather from this that the liver impairment is mild and that nature can handle it pretty well.

Table III shows six cases of nephritic type with hypertension and no apparent liver impairment. This finding has been substantiated by a number of other investigators and must certainly prove valuable in differentiating nephritic toxemia from preeclamptic and eclamptic toxemia. The total number of cases of other writers who agree with this finding are fourteen (Krebs and Diekmann two cases, Smith eight cases, King four cases).

Table IV represents two cases of persistent vomiting with liver function impaired; one case having had to have her uterus emptied.

Table V includes a number of cases reported by other workers showing that in the neurotic type of vomiting there is no impairment of liver function, whereas in the toxic type there is evidence of liver damage. I agree with the others that liver function test is valuable in differentiating the neurotic from the toxic type of vomiting and is likewise a guide as to the efficacy of treatment and when surgical procedures may be wise.

Table VI shows six cases of eclampsia all with mild retention and all recovered. The number of convulsions varied from none to 12.

Table VII includes a group of 15 cases from other writers showing seven cases of marked liver impairment with one death and eight cases of mild impairment with one maternal death; and this death seems to have been due more to the operation, since autopsy showed extremely little liver change. Liver function test in the case of eclampsia seems to indicate the degree of liver involvement and from

TABLE VII. ECLAMPSIA

AUTHOR	IMPAIRMENT MILD	IMPAIRMENT SEVERE	RESULT
Rosenfeld and Schneiders		1	Well
Smith		2	1 death
	2		1 death Vaginal Hysterectomy
Trainor		2	
King		2	Well
	6		Well
Total	8	7	

that the prognosis of the patient may be determined; mild involvement regardless of the number of convulsions may mean a good prognosis, whereas severe involvement may mean a bad prognosis.

The following are the conclusions drawn by the writer from the results of other investigators as well as those of my own.

1. Bromsulphalein is valuable as a liver function test and eliminates the dangers of phenoltetrachlorphthalein.

2. Blood pressure is not perhaps a true guide as to the toxic state of the patient. Hypertension without impairment of liver function may mean a good prognosis. Retention of bromsulphalein with normal blood pressure indicates perhaps a mild type of involvement which needs watching but seems to take care of itself.

3. It is valuable in preeclamptic cases in classifying the degree of toxicity and reaction to treatment.

4. Valuable in differentiating nephritic from preeclamptic and eclamptic toxemia.

5. Useful in differentiating neurotic from toxic vomiting and as a guide to results of treatment and need for surgical interference.

6. Perhaps useful as an aid in prognosis in eclamptic cases.

I am indebted to Dr. J. M. H. Rowland for his permission to carry out this investigation and for his helpful suggestions.

REFERENCES

(1) *Rowntree, etc.:* Johns Hopkins Hosp. Bull., 1913, xxxiv, 327. (2) *Rosenthal, S. M.:* Johns Hopkins Hosp. Bull., 1922, xxxiii, 432. (3) *Rosenthal, S. M.:* Proc. Soc. Exper. Biol. and Med., 1922, xxi. *Rosenthal, S. M.:* Jour. Am. Med. Assn., Dec. 23, 1923, lxxix. (5) *Ottenberg and Rosenfeld, Goldsmith:* Arch. Int. Med., 1924, xxxiv. (6) *Levin-Ryney D'Amory:* South. Med. Jour., Nov., 1924, xvii. (7) *Boardman and Shoonmaker:* Am. Jour. Med. Sc., 1924, clxviii, 688. (8) *Bull and Bauman:* Surg., Gynec. and Obst., 1925, xl, 411. (9) *Mayo, Wm. J.:* Am. Surg., Gynec. and Obst., 1926, xliii, 46. (10) *Rowntree, L. G.:* Tr. Assn. Am. Phys., 1925, xl, 376. (11) *Shattuck, H. F.:* Med. Clin. N. Am., 1925, xix, 601. (12) *Maurer and Gatewood:* Jour. Am. Med. Assn., March 28, 1925, 935. (13) *Rosenau, W. H.:* Jour. Am. Med. Assn., 1925, lxxxv, 2017. (14) *Rosenthal and White:* Jour. Am. Med. Assn., 1925, lxxxiv, 1112. (15) *Rosenthal:* Jour. Am. Med. Assn., 1924, lxxxiii, 1049. (16) *Bloom and Rosenau:* Jour. Am. Med. Assn., Feb. 16, 1924, 54. (17) *Trainor, A. C.:* Can. Med. Assn., 1924, xiv, 511. (18) *Williams, P. F.:* AM. JOUR. OBST. AND GYNEC., 1922, xiv, 26. (19) *Rosenfeld and Schneiders:* Jour. Am. Med. Assn., 1923, lxxx, 743. (20) *Krebs and Dieckman:* AM. JOUR. OBST. AND GYNEC., 1924, xvii. (21) *Smith, J. A.:* AM. JOUR. OBST. AND GYNEC., 1924, viii, 298. (22) *King, E. L.:* AM. JOUR. OBST. AND GYNEC., 1926, xii, 577.

1720 EUTAW PLACE.

DIABETES MELLITUS AND PREGNANCY

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FOR many years following the appearance of Duncan's paper in 1882, diabetes was regarded as one of the most serious complications of pregnancy. In 1909, Williams stated that its gravity had been overestimated, yet at present there exists a great divergence of opinion concerning its importance as a complication of pregnancy and one meets with conflicting statements as to its significance. There are, however, certain points about which there is a general consensus of opinion; namely, that only a small number of diabetic women, perhaps not over 5 per cent, become pregnant; there is a high incidence of abortion or premature labor; when labor progresses to term the children are usually above the average in size; hydramnios seems to be a frequent complication; and the presence of sugar can usually be demonstrated in the amniotic fluid.

Vignis and Barbaro believe that diabetes developing during pregnancy is not so grave a complication as when it existed prior to conception, and in the latter case that the prognosis is especially unfavorable. Weiner also regards it as a very grave complication, and he states that the strain of pregnancy is severe on the pancreas. He holds that it cannot be warded off by insulin, and that women suffering from severe or moderately severe diabetes should not become pregnant, and when they do, that early interruption is indicated. Umber and others have also reported disastrous results in pregnancy complicated with diabetes.

On the other hand, certain authors do not agree with this contention. The work of both Morriss, and Rowley shows that at birth the maternal blood sugar is higher than the fetal. The latter author, as well as Brigham, believes that insulin will reduce to practically nothing the grave dangers of pregnancy complicated by diabetes. Lubin states that mild diabetes is often not aggravated by pregnancy, while Peters reports a case of diabetes which was carried to near term with insulin without serious results. As the entire literature upon the subject has recently been summarized by Lambie, the reader is referred to his article for further literary details.

It is because of this difference of opinion, that we have been interested in studying the metabolism of several diabetic patients during the course of repeated pregnancies. An attempt has been made to have the patient in the hospital for a period of two weeks at intervals during her pregnancy, in order that one may gain fairly accurate information as to the diabetic condition. She is studied not only during the pregnancy, but also for as long a period as possible after delivery. It should be remembered that our conclusions are not based on the study of a single pregnancy, but upon the data obtained during the course of four or five consecutive pregnancies in the same individual.

TABLE I. METABOLISM CHART OF FOURTH PREGNANCY OF PATIENT 1

(Similar Charts Were Employed in All of Our Studies)

DATE 1926	URINE						BLOOD			DIET ORDERED			DIET RECEIVED		
	C.C.	SUGAR %	SUGAR GM.	ACETONE	DIACETIC	TOTAL N.	SUGAR	N. P. N.	CO_2	P.	F.	C.	P.	F.	C.
Jan. 12	1320	.71	9.4	0	0	7.4	.147	31.5	48.0	50	160	70	50.0	161.0	69.0
13	295	.65	2.0	0	0	2.6				40	140	58	41.0	140.0	55.0
14	920	.78	5.8	0	0	8.7				40	140	58	40.8	140.0	59.0
15	780	.59	4.6	0	0	11.0	.145	33.0	44.0	40	140	58	32.0	98.0	38.0
16	840	.72	5.85	0	0	4.3				40	140	58	39.0	127.0	53.0
Feb. 1	1280	.195	2.49	0	0	8.7				40	140	58	36.8	130.0	58.6
2	1265	.247	3.12	0	0	8.9				40	140	58	30.0	103.0	49.0
3	1080	.21	2.26	0	0	9.2				40	140	58	36.0	124.0	56.0
4	1020	.19	1.93	0	0	6.7	.154	30.0	50.5	40	140	58	41.0	140.0	58.0
5	780	.39	3.04	0	0	8.2				40	140	58	34.0	117.0	53.0

TABLE I.—CONT'D

DATE 1926	DIET METABOLIZED						CAL. REQUIRED	CAL. RECEIVED	WT.	HT.	INSULIN
	P.	F.	C.	AV. GL.	AV. FA.	FA/G					
Jan. 12	46.25	156.0	59.6	102.0	160.7	1.6	1701	1985	88.6 K	164.7 cm.	0
13	16.25	151.9	52.9	77.5	143.9	1.9	1701	1697	85 K		0
14	57.37	136.7	53.2	98.4	146.9	1.5	1701	1712			0
15	68.75	83.8	33.4	81.6	105.6	1.3	1701	1198			0
16	26.88	134.9	47.1	76.2	133.2	1.7	1701	1558			0
Feb. 1	51.7	123.2	56.1	101.1	134.9	1.3	1701	1600			45
2	55.6	93.1	45.9	87.5	108.2	1.3	1701	1281	85.5 K		45
3	57.7	126.2	53.7	98.8	139.0	1.4	1701	1530			45
4	41.9	140.5	56.1	94.4	144.9	1.5	1701	1708			45
5	51.1	110.8	50.0	90.7	122.2	1.4	1701	1445			45

We have studied in detail three diabetic women,—two of whom presented four consecutive pregnancies, and one five consecutive pregnancies.

During all of our studies, the patient was in bed and upon a carefully regulated diabetic diet. Daily determinations were made of the amount of sugar, acetone, diacetic acid and total nitrogen in the urine, while the blood was analyzed at frequent intervals for nonprotein nitrogen, sugar, and CO_2 combining power. The amount of food taken by the patient was carefully recorded and a complete metabolism chart kept. As it would require too much space to re-

TABLE II. (Case No. 1.—Patient H. M., Unit 1948, Born 1883, Colored)

PREGNANCY	DATE	DURATION	URINE SUGAR	BLOOD SUGAR	F.A./G.	REMARKS
I	1916	Term	----	----	---	Normal delivery. Child living.
II	11/26/17	Term	0	----	---	Suffered from preeclampsia. Normal delivery. Child living.
III	6/ 8/23	4½ mo.	12.8 gm.	0.194	1.6	In July, 1919, it was discovered that the patient had diabetes, with 33 gm. of sugar in the urine, on admission to the Medical Clinic. She received treatment with insulin for 2 mo. and was discharged with no sugar in urine and with a normal blood sugar.
	6/26/23	5 mo.	2.3 gm.	0.167	1.5	
	7/10/23	6 mo.	22.5 gm.	----	---	
	7/12/23	6 mo.	0	0.182	---	
	7/24/23	+ 6 mo.	20.7 gm.	----	---	
	7/27/23	6½ mo.	0	----	---	Spontaneous premature delivery of stillborn child, premature separation of placenta. Patient was discharged 8/28/23 and was then lost track of until in the subsequent pregnancy in 1925, as shown below.
	7/28/23	1 day p.p.	Faint trace	0.207	---	
	8/28/23	1 month p.p.	14.4 gm.	----	---	
IV	1/12/26	3½ mo.	9.4 gm.	0.147	1.6	No acetone or diacetic acid.
	2/ 5/26	4½ mo.	3.0 gm.	0.154	1.4	Discharged after getting 45 units insulin a day for past 2 weeks.
	3/10/26	5½ mo.	1.0 gm.	0.153	1.6	Receiving 40 units insulin a day.
	5/ 1/26	+ 7 mo.	1.2 gm.	0.091	1.6	Receiving 38 units insulin a day.
	5/19/26	8 mo.	1.9 gm.	0.095	1.4	Receiving 38 units insulin a day.
	6/ 5/26	9 mo.	0	0.118	1.1	No insulin since 6/3/26.
	6/ 8/26	9 mo.	0	0.149	1.1	Labor induced because of vomiting. Child weighed 2750 gm., living.
	6/15/26	7 days p.p.	0	0.158	1.9	Vomiting stopped. Patient in good condition.
	6/18/26	10 days p.p.	No dextrose. Positive for lactose.	0.182	1.9	Discharged without insulin.

produce the complete charts of all the patients, we are giving the figures for two five-day periods (Table I) during one of the admissions of H. M., in the hope that it will give an idea as to how our determinations were made. The data from all the charts have been condensed into tables and are shown in Tables II, III and IV. Each of these three tables records the essential data observed in the consecutive pregnancies of the same woman. The data as to parity and the duration of pregnancy are given in order that one may follow the progress of each pregnancy. The amount of sugar in the urine, in grams wherever possible, otherwise in percentage, as well as the blood sugar in percentage are then given. The column "FA/G" represents the ratio of fatty acids to glucose as metabolized by the patient, and, of course, is of the greatest value in evaluating the

TABLE III. (Case No. 2.—Patient J. S., Unit 2840, Born 1887, White)

PREGNANCY	DATE	DURATION	URINE SUGAR	BLOOD SUGAR	F.A./G.	REMARKS
I	9/ 7/15	Term	0			Normal delivery. Child living.
II	1917	Term	0			Normal delivery following a mild toxemia of pregnancy. Child living.
III	3/30/20	Not pregnant	0.3%	0.194		Glycosuria first noted 1/1/20. Acetone and diacetic positive. Treated in Medical Department.
	5/ 4/20	Not pregnant	16 gm.	0.217		She reports to Metabolism Clinic.
	9/29/20	3 mo.	5 gm.			During this pregnancy she attended the Dispensary every 2 weeks. Her urine remained sugar and acetone free throughout latter part of the pregnancy.
	10/23/20	4 mo.	0	0.084		
	11/12/20	5 mo.	0	0.090		
	3/ 9/21	Term	0			Normal delivery. Child living, weight 3930 gm.
	3/21/21	12 days p.p.	0			Discharged in good condition.
IV	6/ 5/23	Not pregnant	0.1%			She has been visiting the Metabolism Clinic regularly. Diet: P. 60; F. 115; C. 50.
	5/13/24	1 mo.	6 gm.			No acetone. Diet: P. 60; F. 150; C. 45.
	8/12/25	4 mo.	4.6 gm.	0.174		Acetone +; Diacetic 0.
	9/ 7/24	5 mo.	0	0.187	1.5	Diet: Glycerine + P. 70; F. 155; C. 50.
	11/11/24	7 mo.	0	0.122	1.5	Acetone + ; Diacetic + ; Diet as above.
	1/ 6/25	+ 8½ mo.	0			Acetone and Diacetic negative. Diet same.
	1/20/25	– Term	0	0.121		Normal delivery. Child living. Weight 4670 gm. Acetone 0.
	1/23/25	3 days p.p.	0	0.118		Acetone-free.
	3/ 3/25	1½ mo. p.p	0			Acetone-free.
	7/14/25	6 mo. p.p	7.5 gm.			Patient has been making regular visits to the Metabolism Clinic and is adhering fairly well to prescribed diet.
	7/27/26	1½ yr. p.p.	6.8 gm.			

patient's condition. Under "Remarks" we give a brief and concise outline of the clinical condition, as well as such further information as may aid one in following the progress of the pregnancy and the diabetes.

CASE 1.—The patient, H. M. (Table II), had severe diabetes. Her third pregnancy terminated in premature delivery at 6½ months, and she was discharged one month later with a high blood sugar level and sugar in the urine. Her condition during this pregnancy was decidedly unfavorable. The following (fourth) pregnancy was studied in detail and the carbohydrate metabolism was carefully determined at regular and frequent intervals. During this pregnancy, the findings, as summed up in the latter part of Table II, clearly indicate that the diabetic condition started to improve during the fourth or fifth month of pregnancy, and the improvement continued up to term. The patient was discharged 10 days after delivery without dextrose in the urine, but with an elevated blood sugar.

CASE 2.—The patient, J. S., was studied during four consecutive pregnancies, and probably developed diabetes after second pregnancy. The urine and blood determinations, as shown in Table III, indicate that in both the third and fourth pregnancies, the diabetic condition improved at about the fourth or fifth month and that the improvement continued up to term. At the time of both labors, the urine was sugar-free and the blood sugar at a normal level. This relatively satisfactory condition continued for over two months postpartum, but when the patient was seen six months after delivery, the diabetes had returned. It will also be noted that although the urine was positive for both acetone and diacetic acid during the early months of pregnancy, both substances disappeared from the urine as term was approached.

CASE 3.—The patient, M. M., was observed during five consecutive pregnancies. In 1916, shortly after the third pregnancy, it was discovered that she had diabetes mellitus, with a blood sugar of 0.237 per cent and 4 per cent of sugar in the urine. She received treatment in the Medical Clinic and improved rapidly. We were unable to follow her during the following or fourth pregnancy, but carried out repeated metabolism studies during the last, or fifth pregnancy. Our findings are summarized in Table IV. From their study it will be seen that when the patient was first observed at the seventh month of her fifth pregnancy, she had a high blood sugar and almost 4 grams of sugar in the urine. From that time on, her condition continued to improve so that a few days before delivery the blood sugar was within normal limits and the urine was sugar-free. It must, however, be pointed out that we had increased the amount of insulin from 10 units to 30 units a day; but as shown in the postpartum studies, the patient remained sugar-free and with a normal blood sugar for 8 months, although at that time she was receiving no insulin.

Before entering into a general discussion of our results, we wish to report a study of a mild case of diabetes mellitus. Several workers have stressed the necessity of careful diagnosis of a glycosuria developing during pregnancy, and of differentiating lactosuria, alimentary glycosuria, or renal glycosuria due to a kidney hyperpermeable to glucose, from true diabetes mellitus. We believe that, in this last case, the presence of a slightly elevated blood sugar and of acetone bodies in the urine three months postpartum indicate that we had to deal with a true, though mild diabetes.

TABLE IV. (Case No. 3.—Patient M. M., Unit 2103, Born 1888, White)

PREGNANCY	DATE	DURATION	URINE SUGAR	BLOOD SUGAR	F.A./G.	REMARKS
I	1906	Term	0			Normal delivery. Child living.
II	1914	Term				Normal delivery. Child living. Considerable edema and headache.
III	1916	Term	?			Normal delivery. Child living. Two months later patient admitted to medical clinic with diagnosis of diabetes; blood sugar 0.237 and 4% sugar in urine, with acetone and diacetic present. Treated and discharged with urine sugar free and blood sugar 0.109.
IV	1922	Term				Normal delivery. Child stillborn. In 1918 patient was in medical clinic and urine was sugar-free.
	2/18/25	7 mo.	3.72 gm.	0.182	1.9	She had been referred to metabolism clinic 2/10/25, when 23 gm. sugar were found in 24 hour urine specimen. Receiving 10 units insulin a day.
V	2/25/25	7¼ mo.	1.98 gm.	0.121	1.6	Receiving 10 units insulin a day.
	3/ 3/25	7½ mo.	Faint trace	0.124	1.7	Receiving 20 units insulin a day.
	4/19/25	+9 mo.	0	0.118	1.6	Receiving 30 units insulin a day.
	4/21/25	In labor	0		1.6	Labor induced (bag). Child living. Weight 3090 gm. Receiving 30 units insulin a day.
	7/28/25	3 mo. p. p.	0	0.116		Receiving 24 units insulin a day.
	1/21/26	9 mo. p. p.	0	0.093	1.1	Receiving *no* insulin.

TABLE V. (Case No. 4.—Patient M. J., Unit 4123, Born 1899, White)

PREGNANCY	DATE	DURATION	URINE SUGAR	BLOOD SUGAR	F.A./G.	REMARKS
I	4/21/26	3 mo.	8.8 gm	0.143	1.1	Diet: P. 47; F. 67; C. 108; acetone and diacetic negative throughout this month.
	4/28/26	+3 mo.	1.9 gm	0.133	1.2	
	6/28/26	+5 mo.	0	0.143		Acetone and diacetic negative.
	10/12/26	Term	0			Low forceps delivery. Child normal, 3398 gm. Acetone and diacetic negative.
	10/15/26	3 days p. p.	0	0.087	1.6	No insulin throughout the pregnancy.
	1/11/27	3 mo. p. p.	0	0.130		Diacetic and acetone both positive. CO_2 63.3 vol. per cent.

CASE 4.—The patient, M. J., was first seen in the Prenatal Service on April 13, 1926, when she was about 3 months pregnant. She had been told by her private physician that she had sugar in the urine. We studied her throughout this pregnancy and the findings are summarized in Table V. She was kept on a diabetic diet throughout the pregnancy, as well as for three months following the delivery of a normal child at term. From the data reported, it will be seen that at about the fifth month of pregnancy the urine became sugar-free, although the blood sugar was slightly elevated. At term, the urine was still without sugar and the blood sugar was at a normal level. The postpartum studies showed that the urine re-

mained negative for sugar, although the blood-sugar level gradually rose and acetone and diacetic acid appeared in the urine. It is thus fairly evident that at about the fifth month of pregnancy the diabetic condition improved, that at term the patient was without signs or symptoms of diabetes, and that this condition persisted for some time into the puerperium.

DISCUSSION

In 1911, Carlson and Drennan reported experiments relating to the control of pancreatic diabetes in pregnancy. They found that in eight to sixteen hours after pancreatectomy in normal dogs, glycosuria appears, reaching a high point within twenty-four to thirty-six hours post operationem. Identical results were also obtained in early pregnancy, but in dogs at or near term, no sugar appeared in the urine following operation. (But within fourteen hours following delivery by abdominal section, sugar reappeared in the urine.) Two years later Lafon suggested that the absence of glycosuria in depancreatized dogs at term was due to the passage of fetal hormones to the mother and that the fetuses were able to dispose of the excess of maternal blood sugar by oxidation or storage without any embarrassment to their own carbohydrate metabolism. In 1916, Falco endeavored to explain the results of Carlson and Drennan on the supposition that the surplus of maternal blood sugar is metabolized by placental ferments.

Dubreuil and Anderodias reported the case of a diabetic mother who gave birth at the eighth month to a 5000 gram child, whose pancreas showed huge masses of Island of Langerhans tissue. They thought that the continual passage of blood sugar from mother to fetus accounted for the size of the child, as well as for the increase in the amount of island tissue, which they believed developed for the protection of the child against hyperglycemia. Holzbach likewise reports a case of pregnancy associated with edema, hydramnios, ketonuria, glycosuria and a blood sugar of 0.120 per cent. Upon the death of the child in utero the blood sugar rose to 0.210 per cent and the sugar in the urine increased from 10 to 44 grams. At birth the child was stillborn and weighed 4200 grams.

It is essential that the mother be under observation for a period of two or more years after the delivery before we can draw any definite conclusions as to the effect of pregnancy on the course of diabetes mellitus. Springer quotes Colorni as stating that 46 per cent of diabetic mothers die during the first two years postpartum, but the data here presented show that this has not been our experience. From a consideration of the experimental results and of our clinical evidence it appears that pregnancy, particularly during its latter half, may be associated with a change in the maternal carbohydrate metabolism, with the result that in the diabetic, the tendency towards hyperglycemia may be decreased or even disappear during the latter half of pregnancy. How this is brought about we do not know, but the factors responsible for this may be a pancreatic hormone coming from the fetus, a greater demand by the fetus for maternal carbohydrates, or some other as yet unknown mechanism. The work of one of us on the respiratory exchange of the fetus suggests that the fetus uses, at least when near term, carbohydrates for its source of energy, and we have pointed out that there is an unusual demand on the maternal sugar by the fetus.

SUMMARY

Metabolism studies on three patients who suffered from diabetes during repeated and consecutive pregnancies, as well as on a mild diabetic patient in a single pregnancy, were conducted at regular intervals during the state of gravidity, as well as during the puerperium and later. In order to evaluate the severity of the diabetic complication, a complete diabetic chart, as used in this hospital and as shown in Table I, was carefully kept in each case. The main items of these charts, viz., the urine sugar, the blood sugar and the fatty acid to glucose ration (F.A./G.) are summarized for each patient in the several charts, which also contain the information as to the presence or absence of acetone and diacetic acid in the urine, and as to the patient's diet and treatment. The amount of sugar in the urine, the presence or absence of acetone and diacetic acid, the blood-sugar level and the F.A./G. ratio give us a fairly good index of the diabetic condition. Reference has been made to some of the important clinical and experimental findings reported by other workers.

CONCLUSIONS

1. The diabetic woman may undergo a change for the better during the second half of pregnancy.

2. This improvement may be due to the action of fetal pancreatic hormone, to an excessive utilization of maternal carbohydrate by the fetus, as well as to some as yet unknown change in the maternal carbohydrate metabolism which takes place in the latter stages of gravidity.

3. Under careful hospital supervision as to diet, with frequent urine and blood analyses, and with insulin treatment if necessary, the diabetic patient may often go to term and be successfully delivered of a living child, without aggravation of the diabetic condition or indeed with a temporary disappearance of all symptoms during a part of the period of lactation. Of course, it would be unwise to anticipate such an outcome in extremely advanced cases of diabetes.

4. In patients with diabetes mellitus the first half of pregnancy appears to be the precarious period for the fetus, and without any benefit to the mother.

5. The excessive size of children born of diabetic mothers is probably due to the increased supply of maternal blood sugar, as the fetus undoubtedly makes a heavy demand on the maternal carbohydrates not only for its sugar requirements but also in order to build its fat and to supply its own energy.

REFERENCES

Bell, J. N.: Am. Jour. Obst. and Gynec., 1922, iii, 20. *Brigham, E. G.:* N. Y. State Jour. Med., 1923, xxiii, 475. *Carlson, A. J., and Drennan, F. M.:* Am. Jour. Physiol., 1911, xxviii, 391. *Colorni:* Annali di Ostet. e Gyn., 1913. *Dubreuil, G. A., and Anderodias:* Compt. rend. de Soc. de Biol., 1920, lxxxiii, 1490. *Duncan:* Tr. London Obst. Soc., 1882, xxiv, 206. *Falco, A.:* Ann. di Ostet., 1916, i, 1. *Henneberg, H., and Bicke, G.:* Gynec. et Obst., 1925, xii, 72. *Holzbach:* Zentralbl. f. Gynäk., 1926, xli, 2610. *Lafon, G.:* Compt. rend. de Soc. de Biol., 1913, lxxv, 266. *Lambie, G. C.:* Jour. Obst. and Gynec., Brit. Emp., 1926, xxxiii, 566. *Lubin, A.:* Deutsch. Arch. f. Klin. Med., 1923, cxliii, 342. *Morriss, W. H.:* Johns Hopkins Hosp. Bull., 1917, xxviii, 140. *Peters, L.:* Cal. and West. Med., 1925, xxiii, 1300. *Rosenberg, M.:* Klin. Wchnschr., 1924, iii, 1561. *Rowley, W. N.:* Am. Jour. Obst. and Gynec., 1923, v, 23. *Springer, A.:* Zentralbl. f. Gynäk., 1924, xlvii, 2642. *Springer, A.:* Wien. Klin. Wchnschr., 1925, xxxviii, 1108. *Stander, H. J.:* Am. Jour. Obst. and Gynec., 1927, xiii, 39. *Umber, F.:* Deutsche med. Wchnschr., 1920, xlvi, 761. *Vignis, H., and Barbaro, G.:* Presse. Med., 1924, xxxii, 1018. *Wiener, H. J.:* Am. Jour. Obst. and Gynec., 1924, vii, 710. *Williams, J. W.:* Am. Jour. Med. Sc., 1909, cxxxvii, 1.

COMPARATIVE STUDIES ON BLOOD CHOLESTEROL IN WOMEN

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During the course of an investigation on the blood cholesterol in syphilis, 37 of our cases were pregnant women. The cholesterol content in 60 per cent of these showed a high value, 35 per cent a normal value (140 to 179 mg. per 100 c.c. of whole blood) and 5 per cent a low value.[1] This suggested the desirability of ascertaining the cholesterol content of the blood in uncomplicated pregnancies and in pregnancies with complications other than syphilis. Data in the literature indicate, in general, a high cholesterol value during pregnancy.[2, 3, 4, 5, 6, 7, 8]

The present paper treats of the cholesterol content in the blood from normal nonpregnant women (medical students, showing no clinical signs of abnormality), pregnant women showing no clinical signs of abnormality, pregnant women suffering from toxemia and hypertension and pregnant women with syphilis. All determination, excluding those on the medical students, were made on ambulant clinic patients. This fact must be borne in mind because the regulation of the food intake plays an important part in the cholesterol found in the blood and must be taken into consideration in the interpretation of the findings. The patients were allowed their usual diet. No attempt was made to select cases. The method used to determine cholesterol was essentially that of Myers and Wardell.[9]

An analysis of Table I shows that in 10, or 55 per cent, of the eighteen normal nonpregnant women the cholesterol content is between 140 and 179 mg. per 100 c.c. of whole blood, while 8, or 44 per cent, gave values between 180 and 200 mg. per 100 c.c. Let us compare these figures with those in Table II. Here we find that 87 per cent of the 32 normal men had a cholesterol content between 140 and 179 mg., only 12 per cent were between 180 and 187 mg. and none above 190 mg. per 100 c.c. of whole blood.

These two series seem to show that the blood cholesterol content in women is generally higher than in men, the latter approximating more nearly the values in the range "accepted as normal," i.e., 140 to 179 mg. per 100 c.c. of whole blood. If the cases listed in Tables I and II be considered as one group, then 38, or 76 per cent, of the 50 cases

TABLE I. CHOLESTEROL CONTENT OF WHOLE BLOOD IN NORMAL NONPREGNANT WOMEN (EIGHTEEN CASES)

SERIAL NO.	AGE	COLOR	BLOOD CHOLESTEROL MG./100 C.C.	SERIAL NO.	AGE	COLOR	BLOOD CHOLESTEROL MG./100 C.C.
5	23	w	153	29	23	w	175
28	20	w	153	41	22	w	182
18	21	w	157	37	22	w	186
3	23	w	159	41	22	w	190
13	20	w	164	44	30	w	194
38	23	w	164	39	23	w	197
19	24	w	167	20	22	w	201
12	23	w	169	40	22	w	201
4	22	w	174	49	21	w	201

TABLE II. CHOLESTEROL CONTENT OF WHOLE BLOOD IN NORMAL MEN (THIRTY-TWO CASES)

SERIAL NO.	AGE	COLOR	BLOOD CHOLESTEROL MG./100 C.C.	SERIAL NO.	AGE	COLOR	CHOLESTEROL BLOOD MG./100 C.C.
15	22	w	140	17	21	w	163
11	21	w	142	48	23	w	163
6	20	w	143	26	22	w	165
23	22	w	152	14	21	w	167
8	27	w	152	43	23	w	167
9	24	w	154	45	20	w	167
24	25	w	154	32	19	w	169
22	20	w	154	21	21	w	170
34	23	w	157	27	21	w	170
35	21	w	157	25	22	w	171
47	18	w	159	50	25	w	172
31	23	w	159	36	23	w	173
46	22	w	161	2		w	182
30	21	w	162	7	23	w	183
10	28	w	162	33	21	w	186
1	21	w	163	16	23	w	187

are between 140 and 179 mg. per 100 c.c. of whole blood, and 12, or 24 per cent, between 180 and 201 mg. per 100 c.c.

Tables III and IV show the results in 91 cases of normal pregnant women; 3 patients in the second month of gestation had a cholesterol content between 140 and 179 mg. per 100 c.c. of whole blood. Twelve were in the third month of pregnancy; 9, or 75 per cent, had a cholesterol content between 140 and 179 mg. per 100 c.c. of whole blood and 3, or 25 per cent, gave values between 180 and 200 mg. per 100 c.c. Eleven were in the fourth month of pregnancy. Of these 3, or 27 per cent, showed a blood cholesterol content between 140 and 179 mg. per 100 c.c.; 4, or 36 per cent, between 180 and 200 mg. per 100 c.c. and 4, or 36 per cent, above 200 mg. per 100 c.c. of whole blood. There were 19 cases in the fifth month of gestation; 7, or 37 per cent, had a cholesterol content between 140 and 179 mg. per 100 c.c. of whole blood; 5, or 27 per cent, between 180 and 200 mg., and 7, or 37 per cent, above 200 mg. per 100 c.c. Fifteen were in the sixth month of pregnancy; 5, or 33 per cent, of these gave cholesterol values between 140 and 179 mg. per 100 c.c. of whole blood; 3, or 20 per cent, between 180 and 200 mg., and 7, or 47 per cent, above 200 mg. per 100 c.c. Of the 20 cases in the seventh month of pregnancy, 3, or 15 per cent, showed a cholesterol content between 140 and 179 mg. per 100 c.c. of whole blood; 7, or 35 per cent, between 180 and 200 mg. and 10, or 50 per cent, above 200 mg. per 100 c.c. There were 6 cases in the eighth month of gestation; in 2, or 33 per cent of these, the cholesterol content was found to be between 180 and 200 mg. per 100 c.c. of whole blood; and in 4, or 66 per cent, it was above 200 mg. per 100 c.c. Five cases were in the ninth month of pregnancy. Of these 1 gave a cholesterol value in the range of 140 to 179 mg. per 100 c.c. of whole blood; 1 in the range of 180 to 200 mg., and 3 were above 200 mg.

These data indicate, although not conclusively, (1) that as pregnancy progresses the cholesterol content in whole blood increases; (2) that, in general, the cholesterol in normal pregnant women is greater than in normal nonpregnant women.

The data on pregnancies complicated with toxemia and hypertension are given in Tables V and VI. Three cases in the second month of pregnancy had a cholesterol content between 140 and 179 mg. per 100 c.c. of whole blood. Of 6 cases in the third month of gestation, 1 showed a cholesterol value below 140 mg. per 100 c.c.; 3 were between 140 and 179 mg. and 2 above 200 mg. per 100 c.c. of blood. We studied 1 case in the fourth month of pregnancy. It had a cholesterol value between 180 and 200 mg. per 100 c.c. of blood. The one case in the fifth month of pregnancy showed a cholesterol content between 180 and 200 mg. per 100 c.c. of whole blood. There were 3 cases in the sixth month of gestation. Here 1 case gave a cholesterol value be-

TABLE III. CHOLESTEROL CONTENT OF WHOLE BLOOD IN NORMAL PREGNANT WOMEN (NINETY-ONE CASES)

SERIAL NO.	AGE	COLOR	DURATION OF GESTATION (MONTHS)	BLOOD CHLOESTEROL MG./100 C.C.	REMARKS
61	26	b	2	139	
72	42	w	2	174	Miscarriage
47	25	w	2	175	
80	36	b	3	153	
90	21	w	3	155	
41	41	b	3	157	
17	29	w	3	158	
88	22	b	3	159	
43	31	b	3½	167	
92	34	w	3	170	
49	30	b	3½	171	
84	31	b	3	175	
9	25	b	3	186	
91	26	w	3	190	
27	37	w	3	200	
78	32	w	4	155	
99	38	w	4	161	
46	30	w	4½	165	
93	23	w	4	190	
59	27	w	4	194	
32	31	b	4	194	
81	26	b	4	200	
34	37	b	4	201	
64	19	b	4	206	
15	24	b	4	207	
76	32	b	4½	242	
11	25	w	5	153	
101	21		5	162	
133	34	w	5	163	
45	20	b	5	169	
57	19	w	5	176	
69	28	w	5	178	
24	24	b	5	178	
83	35	w	5	183	
51	30	b	5	189	
13	30	b	5	195	
85	31	b	5	197	
62	19	b	5	200	
97	30	b	5	201	
21	39	w	5	214	
96	22	w	5	214	
66	28	w	5	224	
18	42	w	5	250	
94	27	b	5	306	
95	36	w	5	326	
86	21	w	6	153	
67	36	b	6	163	
40	24	b	6	164	
5	21	w	6	172	
4	21	b	6	176	
25	26	b	6	196	
29	33	w	6	198	
77	18	w	6	200	
36	34	w	6	204	
38	20	w	6	204	
100	30	b	6	217	
26	29	w	6	226	
68	29	w	6	233	
12	32	w	6	238	

TABLE III—CONT'D

SERIAL NO.	AGE	COLOR	DURATION OF GESTATION (MONTHS)	BLOOD CHLOESTEROL MG./100 C.C.	REMARKS
63	19	w	6	238	
39	32	w	7	160	
14	27	w	7	174	
60	23	b	7	174	
58	17	w	7½	185	
7	29	w	7	190	
55	26	w	7	193	
22	32	w	7	193	
3	26	b	7	197	
98	25	w	7	200	
37	26	w	7	200	
87	33	w	7	202	
16	19	w	7	202	
50	29	w	7	205	
74	17	w	7	206	
79	22	w	7	208	
75	29	w	7	218	
53	29	w	7	218	
30	28	w	7	220	
60	23	b	7	226	
28	27	w	7	230	
19	28	b	8	186	
6	26	w	8	192	
8	26	w	8	203	
23	25	b	8	205	
52	32	w	8	215	
2	23	w	8	246	
10	35	b	9	175	
657 S.H.	28	b	9	189	
1	21	w	9	208	
706 S.H.	42	w	9	225	
20	19	w	9	244	

TABLE IV. SUMMARY OF CHOLESTEROL FINDINGS IN NORMAL PREGNANT WOMEN

	DURATION OF GESTATION							
	2 MO.	3 MO.	4 MO.	5 MO	6 MO.	7 MO.	8 MO.	9 MO.
Number of cases	3	12	11	19	15	20	6	5
Cholesterol values in mg. per 100 c.c. of whole blood:								
140 to 179	3	9	3	7	5	3	0	1
180 to 200	0	3	4	5	3	7	2	1
Above 200	0	0	4	7	7	10	4	3

tween 180 and 200 mg. and 2 cases above 200 mg. per 100 c.c. Of 8 cases in the seventh month, 1 showed a cholesterol content between 140 and 179 mg.; and 7, or 87 per cent, were above 200 mg. per 100 c.c. Four, or 66 per cent, of the cases in the eighth month of gestation had a cholesterol content above 200 mg., while 2, or 33 per cent, had a content between 140 and 179 mg. per 100 c.c. Twenty-nine cases were in the ninth month of pregnancy. Of these, 18, or 62 per cent, had a cholesterol content above 200 mg.; 4, or 14 per cent, gave a value between 180 and 200 mg.; and 7, or 24 per cent, between 140 and 179 mg. per 100 c.c. of whole blood.

TABLE V. CHOLESTEROL CONTENT OF WHOLE BLOOD IN PREGNANCIES COMPLICATED WITH TOXEMIA AND HYPERTENSION (FIFTY-SEVEN CASES)

SERIAL NO.	AGE	COLOR	DURATION OF GESTATION	BLOOD CHOLESTEROL MG./100 C.C.	REMARKS
653	28	w	2	159	Hypertension
697	38	w	2	169	
413	35	w	2½	174	Sl. hypertension; toxemia
421	24	w	3	92	Hypertension; nephritis
420	35	b	3	156	Hypertension; arteriosclerosis
495	31	w	3	158	Toxemia; jaundice
709	29	b	3	160	Hypertension, albuminuria
698	25	b	3	228	Hypertension
703	34	w	3	238	Hypertension
720	32	b	4	248	Albuminuria; arteriosclerosis with convulsions
654	28	w	5	192	Albuminuria
694	29	w	6	200	Hypertension
409	35	b	6	204	Hypertension; edema
546	23	b	6	231	Hypertension; nephritis
646	40	w	7	156	Hypertension; nephritis
718	42	b	7	206	Hypertension; aterioselerosis; edema
442	20	w	7	216	Hypertension
689	40	b	7	216	Hypertension; toxemia
717	30	w	7	219	Hypertension
711	23	b	7	232	Hypertension
712	24	w	7	235	Hypertension
500	43	w	7	426	*Sl. hypertension*
692	23	w	8	146	Hypertension; toxemia
693	24	w	8	151	Hypertension
716	39	w	8	181	Hypertension; toxemia
655	22	b	8	206	Hypertension
422	41	b	8	240	Hypertension
715	35	w	8	246	Hypertension; albuminuria
487	29	w	9	153	Hypertension
432	32	w	9	155	Hypertension; goiter
454	26	w	9	160	Hypertension
488	33	w	9	160	Hypertension
443	21	w	9	162	Hypertension
550a	17	b	9	168	Hypertension
530	20	w	9	179	Hypertension
489	44	w	9	186	Hypertension
412	36	w	9	187	Hypertension
549	35	w	9	198	Hypertension
550	40	w	9	198	Hypertension
545	21	w	9	201	Hypertension
719	32	w	9	204	Hypertension
418	27	w	9	213	Hypertension
695	39	w	9	220	Hypertension
713	51	b	9	244	Hypertension; albuminuria
691	22	w	9	227	Hypertension toxemia
528	21	w	9	228	Hypertension
526	19	b	9	229	Hypertension
700	32	w	9	229	Hypertension; toxemia; albuminuria
684	40	w	9	231	Hypertension
683	27	w	9	232	Hypertension
543	34	w	9	234	Sl. hypertension
529	27	w	9	238	Hypertension
649	35	w	9	249	Hypertension
568	23	w	9	300	Hypertension
505	24	w	9	332	Hypertension
501	37	b	9	343	Anemia; hypertension
567	27	w	9	425	Hypertension

TABLE VI. SUMMARY OF CHOLESTEROL FINDINGS IN PREGNANCIES COMPLICATED WITH TOXEMIA AND HYPERTENSION (FIFTY-SEVEN CASES)

	DURATION OF GESTATION							
	2 MO.	3 MO.	4 MO.	5 MO	6 MO.	7 MO.	8 MO.	9 MO.
NUMBER OF CASES	3	6	1	1	3	8	6	29
CHOLESTEROL VALUES IN MG. PER 100 C.C OF WHOLE BLOOD								
Below 140		1						
140 to 179	3	3	0	0	0	1	2	7
180 to 200	0	0	0	1	1	0	0	4
Above 200	0	2	1	0	2	7	4	18

TABLE VII. CHOLESTEROL CONTENT OF WHOLE BLOOD IN PREGNANT SYPHILITIC WOMEN (THIRTY-SEVEN CASES)

SERIAL NO.	AGE	COLOR	DURATION OF GESTATION	BLOOD CHOLESTEROL MG./100 C.C.	WASSERMANN REACTION ANTIGEN ALCOHOLIC	CHOLESTEROL
121	28	b	3	160	+	0
394	37	w	3	165	++++	++++
387	29	b	3	168	++++	++++
391	24	b	3	188	++++	++++
270	38	b	3	211	0	0
187	31	w	4	146	++++	0
117	30	b	4	157	++++	++++
122	28	b	4	174		
393	28	w	4	222	+	++
115	20	w	5	172	+	++
221	31	w	5	175	++++	++++
179	24	b	5	194	0	++
336	23		5	198	++	++
196	31	b	5	200	++++	++++
123	18	b	5	204	0	+
204	30	b	5	211	++++	++++
395	25	b	5	224	++++	++++
111	28	w	5	230	++++	++++
392	43	w	5	248	++++	++++
291	35	b	6	138	0	+++
280	25	w	6	179	++++	++++
345	30	b	6	202	++++	++++
116	28	b	7	125	++++	++++
378	18	b	7	160	0	+
398	35	b	7	170	0	++
382	25	b	7	178	++++	++++
114	27	b	7	194	++++	++++
390	31	b	7	200	++++	++++
385	16	b	7	201	++++	++++
343	20	w	7	202	+	++
113	33	b	7	204	++++	++++
119	18	b	7	218	++++	++++
341	41	w	7	253	++++	++++
396	41	b	7	253	++	++
112	32	b	8	179	0	+++
376	20	w	8	199	0	+
120	28	b	8	241	++++	++++

TABLE VIII. SUMMARY OF CHOLESTEROL FINDINGS IN PREGNANT SYPHILITIC WOMEN (THIRTY-SEVEN CASES)

	DURATION OF GESTATION					
	THREE MONTHS	FOUR MONTHS	FIVE MONTHS	SIX MONTHS	SEVEN MONTHS	EIGHT MONTHS
NUMBER OF CASES	5	4	10	3	12	3
CHOLESTEROL VALUES IN MG. PER 100 C.C. OF WHOLE BLOOD						
Below 140				1	1	
140 to 179	3	3	2	1	3	1
180 to 200	1	0	2	0	1	0
Above 200	1	1	6	1	7	2

As was the case with the data on normal pregnancies, so also, with pregnancies complicated by toxemia and hypertension there is indicated an increase in the cholesterol content of whole blood as pregnancy advances. The percentage of cases giving high cholesterol values (values above 180 mg. per 100 c.c. of whole blood) is practically the same in both series. In the former 66 per cent gave values above 180 mg. whereas in the latter there were 60 per cent.

Tables VII and VIII show the results in 37 cases of pregnant syphilitic women, 29 with a strongly positive Wassermann reaction and 9 with a negative Wassermann reaction. Five patients were in the third month of gestation; 3 had a cholesterol content between 140 and 179 mg. per 100 c.c. of whole blood, 1 between 180 and 200 mg. and 1 above 200 mg. Four cases were in the fourth month of pregnancy. Three of these had a cholesterol content between 140 and 179 mg. and 1 above 200 mg. per 100 c.c. Of the ten cases in the fifth month of pregnancy, 2 showed a cholesterol content between 140 and 180 mg., 2 between 180 and 200 mg. and 6 above 200 mg. per 100 c.c. There were 3 cases in the sixth month of gestation; 1 had a cholesterol content below 140 mg., 1 between 140 and 179 mg. and 1 above 200 mg. per 100 c.c. Seven of the 12 women in the seventh month of pregnancy had a cholesterol content above 200 mg., 1 between 180 and 200 mg., 3 between 140 and 179 mg. and 1 below 140 mg. per 100 c.c. of whole blood. Two cases in the eighth month of gestation showed a cholesterol content above 200 mg. and 1 between 140 and 179 mg. per 100 c.c.

Here again as in the two other series of data for pregnant women, 60 per cent of the cases show a high cholesterol content, i.e., above 180 mg. per 100 c.c. of whole blood. The increase in blood cholesterol content with advance in pregnancy, however, is not as marked as in the previous series although there is a strong tendency in that direction.

CONCLUSIONS

1. The blood cholesterol content in normal nonpregnant women is generally higher than in normal men.
2. The cholesterol content in normal pregnant women is greater than in normal nonpregnant women.

3. As pregnancy progresses, the blood cholesterol content increases. This is indicated by the data on pregnancies complicated with other diseases (toxemia, hypertension and syphilis) as well as by the data on normal pregnancies.

4. The percentage of cases giving high cholesterol values (above 180 mg. per 100 c.c. of whole blood) is practically the same for the three series, 66 per cent of the normal pregnancies, 60 per cent of the pregnancies complicated by toxemia and hypertension and 60 per cent of the pregnancies associated with syphilis.

We appreciate sincerely the interest of the late Professor William E. Studdiford, Professor William E. Caldwell, Dr. Jean Corwin and the entire staff of the Sloane Hospital for Women. Without their very helpful and willing cooperation, this investigation would have been difficult.

It is a pleasure, also, to thank Professors William J. Gies and Edgar G. Miller, Jr. for their kind suggestions.

REFERENCES

(1) *Rosen and Krasnow:* Arch. Dermat. and Syph., 1926, xiii, 506. (2) *Aschoff:* Wiener klin. Wchnschr., 1911, xxiv, 559. (3) *Bacmeister and Havers:* Deutsch. med. Wchnschr., 1914, xl, 385. (4) *Bloor:* Jour. Biol. Chem., 1916, xxv, 577. (5) *Luden:* ibid., 1916, xvii, 273. (6) *Denis:* ibid., 1917, xxix, 93. (7) *Craig and Williams:* Am. Jour. Syph., 1921, v, 392. (8) *Mayo:* Ann. Surg., 1925, lxxxi, 955. (9) *Myers and Wardell:* Jour. Biol. Chem., 1918, xxxvi, 147.

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THE CURE OF CHRONIC GONORRHEA IN THE FEMALE BY MEANS OF A SINGLE SUBCUTANEOUS INJECTION OF LIVE GONOCOCCI

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TO INJECT live virulent gonococci into a human being at first thought would impress one simply as a risky experiment of producing a sepsis. We well know that gonococci may enter the blood stream and then are likely to produce affections of the joints or the heart, even lead to death through sepsis. However, we are equally well acquainted with the fact that the gonococcus proves invasive and virulent solely when in contact with special tissues such as the mucosa of the genital tract in which it can develop its pathogenic qualities. This knowledge deprives such an experiment almost completely of its potential danger. The idea of killing with injection of live bacteria active foci of the same bacteria somewhere in the body is not new. It has been applied in the treatment of infections with the tubercle bacillus, the bacterium coli, also in malaria patients. Inunctions with weakened cultures of spirochetes have been used in the treatment of syphilis.

There is an essential difference between the artificial introduction, e.g., of the anthrax bacillus, either through the intestinal tract or through the skin surface. Only the latter offers conditions favorable for its further growth. They do not exist in the intestines where the anthrax bacillus therefore will quickly die. A gonococcus will readily get a firm foothold in the urethral mucosa but will succumb in the cutaneous or subcutaneous tissues. It is impossible for the gonococcus to pass from such tissues into blood or lymph channels. No harm is done even if accidentally gonococci are injected directly into the blood stream by unintentional puncturing of a vessel. A few experiences of this sort in healthy individuals showed that the blood immediately destroys these bacteria. There undeniably exists a marked difference between the periodic invasion of gonococci into the blood from a focus in acute or subacute conditions and the one time injection of a small measured quantity of gonococci into a healthy individual with normal temperature suffering from a chronic gonorrhea—probably on account of an immunity gradually acquired from the symptomless chronic gonorrheal focus.

I look upon the chronic gonorrhea of woman as a latent infection, in the main representing a chronic infection of lymph glands. To influence such a condition favorably and promptly, so far has proved impossible by means of known therapeutic measures. Vaccine therapy and particularly all purely local methods of treatment have failed. Only the so-called fresh-vaccine, which some time ago was proposed by me, yields better and readier results. But even with this vaccine weeks and months are required for the cure of chronic cases and in that space of time, of course, a chronic process might also heal spontaneously. We certainly must give preference to a method which immediately after its application, right under our eyes within a few days, effects the cure of a disease which has existed for years, and especially so if no untowards by-effects can be noticed.

This new method is applied in the following manner: From the pus of an acute gonorrhea, male or female, a pure culture is made on ascites-blood agar (half and half). This can be obtained after the first or second transfer. It is important for the therapeutic efficacy that the gonococci are isolated quickly and pass back into the human body after but 24 to 48 hours on the artificial medium. The longer they live on the culture medium, the more they lose their therapeutic efficiency. The germs, grown in this manner on ascites-blood agar in a long serpentine line, are washed off in 3 ccm. of sterile physiologic salt solution. No harm is done if some of the agar is scraped off in the procedure. This suspension is taken up in a syringe and from one-half to one ccm. of it injected subcutaneously in the upper arm. With but one puncture two or three separated wheals can be produced. One culture tube as a rule will suffice for three patients. There are approximately 10 thousand millions of gonococci in one slanting agar tube so that between two and four milliards are contained in one hypodermic injection. Experience shows that the exact quantity is of minor importance as long as the number of injected germs does not sink below one or rise above eight thousand millions.

Within 24 hours a flaming red erythema develops at the point of injection surrounded by a doughy infiltration. The arm becomes painful but without any swelling of regionary lymph glands. A lymphadenitis or lymphangitis never develops. The erythema is associated with slight rise in temperature, only rarely reaching 38° C. Patient complains of headache, which can be prevented by preliminary administration of some salicylic acid preparation. At the latest within 24 hours after the injection the erythema begins to fade, all clinical symptoms have in the meantime disappeared and the patient is able to resume the customary work since the arm again can be freely used. The infiltration is resorbed gradually and may still be felt even after weeks. If agar was injected with the suspension often (otherwise but rarely), a small afebrile abscess is observed to develop from which gonococci can be obtained in pure culture. Similar injections can be made as well in the skin of the back. The treatment does not require detention of patient at home or hospital.

Which of the chronic gonorrheal cases can be treated in this manner?

1. An injection of live gonococci should be made only if patient for the past six or eight weeks (two menstrual terms) has not been treated in any manner, also not locally, because any type of treatment might change a chronic condition into an acute one, when the injection of live gonococci certainly would prove useless.

2. For this same reason the time of menstruation is unsuitable for an injection because at this time a chronic inflammatory process occasionally is seen to flare up acutely.

3. Women with active mucosal gonorrhea—e.g., in Bartholin gland or rectum, must not be treated in this manner.

4. Excluded are furthermore patients who recently have passed through another acute infectious disease (influenza, diphtheria, etc.).

In other words, only the truly chronic cases are suitable for this treatment.

When is patient cured?

It seems superfluous to follow the injection by often repeated examinations of cervical smears. Within the first few days after the injection gonococci will always be found in the cervical canal. In this location, like on any other open mucosal surface, gonococci obviously cannot be directly affected by the subcutaneous injection. They will continue their parasitic existence there until finally killed by the physiologic defense action of normal tissues. After the hypodermic injection first of all the germs within glands and body tissues will succumb to developing toxins. No new generations of gonococci will be formed. A few days later the diplococci usually cannot any longer be discovered in the cervix. But if they still are found there they can now be easily destroyed by a single application of one of the customarily employed antiseptics. I hardly ever found it necessary to do this. With but one injection one might see a complete cure effected in a case, observed and treated unsuccessfully often for years. In case of failure a second and even a third injection still may bring the desired cure but I rather incline to the belief that not too much can be expected if the first injection did not yield the expected prompt result. If in three successive menstrual intervals cervical smears are negative and if after local or general provocative measures gonococci fail to reappear, then it seems justifiable to ascribe their prompt disappearance to the injection. Cure, i.e., complete disappearance of all gonococci, usually is achieved within eight to fourteen days after the injection. If they are still found in the third week, the patient in my experience has almost invariably proved absolutely refractory to any form of treatment.

Which chronic gonorrhea patients are found refractory to toxins produced by the injection of live bacteria?

It was striking that most of the failures were encountered in patients of a definite constitutional type. They all showed a tendency towards exudate formation and lymphatic swellings, had previously often suffered from colds and gland disturbances, are inclined towards adiposity, and seem to be characteristic representatives of the so-called lymphatic-exudative type.

How can the prompt therapeutic effect be explained?

The injected live gonococci, more or less promptly, perish within these most unsuitable surroundings. They do not find a chance to establish themselves or to multiply. The question remains open whether the surprisingly prompt recovery of the patient should be ascribed to the quantity or specificity of toxins produced by the death of the injected germs or must be explained on the basis of a greatly stimulated general defense mechanism of the entire body to account for this beneficial curative effect in regions of the body far distant from the site of injection. Possibly both these factors play a rôle. The failures in individuals of a peculiar constitutional type then might be due to their limited ability to react as compared with this same ability in representatives of a better constitution.

I reported my results with this treatment in 1922 at the Leipzig Meeting of German Naturalists and in 1926 before the Urological Society in Berlin. In the meantime more patients have been treated. Together with my associates we have made more than 300 injections without observing harm in a single instance. Personally I have treated 118 women suffering from chronic gonorrheal processes with the injection of live gonococci. Of these, 68 were cured with a single injection and 5 others with two and three injections respectively.

Considering only the 68 women cured with one injection we can state:

They all had been unsuccessfully treated in various ways, either with vaccines or locally. They all had proved to be affected by a rather stubborn infection. The shortest interval since acquisition of the infection in any of them was five months, the longest three and a half years. Three months should have passed since infection before an attempt should be made with injection of live gonococci. Only so it will be certain that the case is truly chronic, that the chances for spontaneous cure are rather limited. As already stated, in acute and subacute cases, in my belief, this new treatment will fail to yield noteworthy results.

After this experience, gained in six years, I conclude that (1) patients suffering from chronic gonorrhea sustain this treatment without the slightest ill effect; (2) a single injection of live gonococci might effect prompt cure of a chronic gonorrhea; (3) of 118 gonorrheal patients, unsuccessfully treated beforehand in various ways, 68 (approximately 60 per cent) recovered after a single injection.

These results justify more extensive employment and test also in cases, clearly chronic, even if not previously subjected to any other type of therapy. I feel certain that in this manner the chronic stage is made to disappear quicker and better than with the vaccine therapy and that the percentage of final cures of chronic cases is increased. My material includes only instances of failures with other measures. It is noteworthy that among my failures there are so many patients of the exudative-lymphatic type in whom the gonorrheal infection tends to assume the character of a latent lymph gland infection.

FIBROMYOMATA AND PREGNANCY, A STUDY OF 250 CASES

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(From the Sloane Hospital for Women.)

Cragin and Ryder[1] reported the cases of fibromyomata and pregnancy occurring among the first 20,000 patients admitted to the Sloane Hospital for Women. This paper deals with the similar cases among the succeeding 30,836 admissions to the Sloane Hospital to January, 1925. It completes a study of the Sloane series of fibromyomata in over 50,000 consecutive pregnancies.

A statistical study has been made of the many facts found in the clinical records bearing upon the relations of fibromyomata to pregnancy, labor and the puerperium. The following topics have been selected for discussion: (1) the incidence of fibromyomata noted during pregnancy; (2) spontaneous abortion and premature labor; (3) the effect of fibromyomata upon the course of pregnancy and labor; (4) pelvic fibromyomata: treatment and sequelae for mother and baby; (5) cases in which operative interference during pregnancy,

TABLE I. COMPARISON OF INCIDENCE OF CERTAIN OBSTETRIC ABNORMALITIES IN CASES WITH FIBROMYOMATA WITH 8317 UNSELECTED CONSECUTIVE CASES

	ABORTION PREMATURE LABOR	DRY LABOR	UTERINE INERTIA	PROLONGED LABOR	MEDIUM FORCEPS	HIGH FORCEPS
Fibromyomata	24.1% 39 of 191	44.5% 45 of 101	34.6% 35 of 101	16.8% 17 of 101	16.8% 17 of 101	2.9% 3 of 101
Unselected Cases	14%	7.5%	1%	1%	7.5%	0.6%

labor or the puerperium was thought necessary because of the fibromyomata themselves; (6) maternal mortality; (7) fetal mortality.

Observations on the behavior of the fibromyomata of these patients after pregnancy, and in subsequent pregnancies will be reported at another time.

1. THE INCIDENCE OF FIBROMYOMATA DURING PREGNANCY

In this series of 30,836 pregnant women, fibromyomata were noted in 250 or 0.8 per cent. Cragin and Ryder reported 0.45 per cent (89 of 20,000) and Pinard[2] 0.6 per cent (84 of 13,915).

Fifty-nine of the 250 women had fibromyomata so situated and so small that they could not be held to have any clinical significance. Many of these, indeed, were only diagnosticated on inspection of the uterus at laparotomy. These cases will not be mentioned further. The 250 cases are thus reduced to 191, giving an incidence of 0.6 per cent of clinically important fibromyomata.

The tumors were classified on the usual basis of their position as pedunculated, subperitoneal, intramural, intraligamentous, submucous or pelvic. Most of the cases represented combinations of two or more of these varieties so that classification became complicated and conclusions difficult. The pelvic tumors alone seemed to justify their separate grouping from the standpoint of useful clinical deductions. They will be described below.

2. SPONTANEOUS ABORTION AND PREMATURE LABOR

Abortion is defined as the discharge of the fetus before the period of viability. Premature labor is defined as labor occurring between the thirtieth and thirty-eighth week of gestation.

Only two of the 250 cases observed at Sloane aborted spontaneously in the first trimester. In consideration, however, of the uncertainty of all the facts relative to the incidence of abortion in this period, no conclusion seems justified. A striking situation, however, becomes apparent when abortion after the third month and premature labor are studied. In this period, 20 women aborted spontaneously, and 19 additional patients fell into spontaneous premature labor. Thus 39, or 24.1 per cent, of the 191 women either aborted or had premature labor. The fetal mortality of these cases was 78.7 per cent.

TABLE I—CONT'D

	BREECH DELIVERY MAURICEAU	INTERNAL PODALIC VERSION	HEMORRHAGE	FETAL MORTALITY AFTER 3 MOS.	MATERNAL MORTALITY
Fibromyomata	18.8% 19 of 101	8.9% 9 of 101	33.6% 58 of 191	32.1% 62 of 193	3.6% 7 of 191
Unselected Cases	6%	2%	4%	6.6%	0.9%

The tumors themselves were considered to be the actual clinical cause of 16 of these abortions and of 14 of the premature labors. This gives an incidence of abortion and premature labor due to the fibromyomata of 16 per cent (31 out of 191).

Similar findings are reported by other writers. Pinard found 15 per cent (13 of 84), Lobenstine[3] found 15 per cent (100 cases), while Cragin and Ryder reported a 24 per cent (22 of 89) incidence of spontaneous abortion or premature labor in cases of fibromyomata complicating pregnancy.

These facts establish clearly the high incidence of spontaneous abortion and premature labor. Fibromyomata must, therefore, be ranked clinically with the toxemias of pregnancy, syphilis, and abnormal conditions of the cervix, as one of the most important conditions causing abortion and premature labor. The question arises whether or not these accidents can be prevented to any important degree. They can if obstetricians become aware of their danger and if they will safeguard their patients by very frequent antepartum observations to detect the first signs of abnormal irritability of the uterus. In addition they must take extraordinary pains to instruct their patients as to the causes and prevention of abortion and premature labor.

3. THE EFFECT OF FIBROMYOMATA UPON THE COURSE OF PREGNANCY AND LABOR

The tradition is established that fibromyomata are relatively harmless. Thus Cragin said that, "Although the association of fibromyomata and pregnancy is relatively a frequent one, disturbance by them of the normal course of labor is unusual." This attitude is probably founded upon the repeated observation that relatively few fibromyomata cause obstruction to the presenting part. While this is true, there are repeated observations in the literature that show that the incidence of many other important complications of pregnancy, labor, and the puerperium is increased by the presence of these tumors. That such is the fact is shown in Table I.

This markedly increased incidence of serious abnormalities in the cases of fibromyomata forces the conclusion that the traditional lack of respect for them as a clinical danger is unwarranted.

4. TREATMENT AND SEQUELAE OF PELVIC FIBROMYOMATA FOR MOTHER AND BABY

Pelvic fibromyomata are defined for this paper as those which were described in the clinical records as "pelvic" or "in the lower uterine segment."

The incidence of pelvic fibromyomata was 15 per cent (30 of 191). Cragin and Ryder reported 12.3 per cent (11 of 98). Of their cases two were delivered vaginally after pushing the tumor out of the pelvis. The remaining nine had the following operations: hysterectomy 4, myomectomy 2, cesarean section 1, cesarean section and hysterectomy 1, craniotomy 1. Thus 81.8 per cent of their cases required major operative interference.

In the present series of 30 cases, operative interference was necessary in 22, or 73.3 per cent. The following operations were done: cesarean and hysterectomy at term 11, cesarean and myomectomy at term 6, cesarean alone 1, hysterectomy at six months 2, vaginal myomectomy at term 1, abdominal myomectomy at two months 1. Sixteen of the 30 cases of pelvic fibroyomata were given a trial labor. Eight of these cases were delivered through the vagina. The remainder required cesarean section. The maternal mortality was 3.33 per cent; the fetal mortality was 30 per cent.

One of these patients was delivered vaginally after pushing an obstructing tumor out of the pelvis. In her next pregnancy cesarean section was necessary after a twenty-four hour trial labor.

5. OPERATIVE INTERFERENCE DURING PREGNANCY, LABOR, OR THE PUERPERIUM, WHOSE CHIEF INDICATION WAS THE FIBROMYOMATA

Major operative procedures were undertaken because of the fibromyomata in 42, or 21.4 per cent of the 191 cases. The following operations were done: therapeutic abortion 1, hysterectomy before viability 6, vaginal myomectomy 1, abdominal myomectomy 4, induction of labor with bag followed by cesarean and myomectomy 1, cesarean and myomectomy 8, cesarean and hysterectomy 19, postpartum hysterectomy 2.

The maternal mortality was 1.5 per cent; the fetal mortality 7.7 per cent. In addition, the following 48 obstetric operations were done: 9 versions, 20 breech deliveries, 3 high forceps and 16 medium forceps. This gives a total incidence for operative interference of 46.5 per cent.

Lobenstine, reporting 85 cases at or near term, found major operative interference necessary six times before or during labor, and eight times during the puerperium. This gives an incidence of interference of 16.4 per cent. In addition he reported 15 vaginal operative deliveries, so that his total incidence of operative interference was 34.1 per cent.

Pinard reported 35.7 per cent of 84 cases requiring intervention, four times during pregnancy and 24 times during labor.

Lockyer[4] summarized Scipiades' paper based upon 67 cases. Scipiades found that operation became imperative in from 30 to 33 per cent of the cases. Lockyer himself reported 23 cases in which operation was necessary in 19 cases or 82.6 per cent.

It seems possible to conclude from these combined observations, covering a large series of cases, that major operative interference becomes necessary in about 20 per cent of the cases. Vaginal operative interference becomes necessary in roughly another 20 per cent of the cases. With these facts established it is impossible to agree with the conclusion so often expressed in the literature that fibromyomata rarely cause trouble or require special treatment.

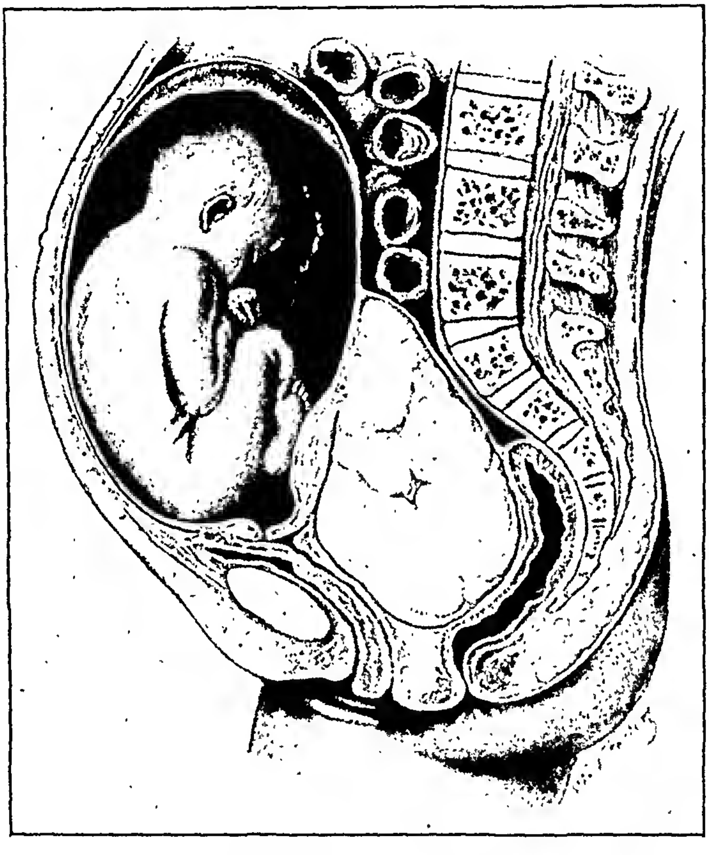

Fig. 1.—Hysterectomy at six months, during labor for incarcerated retroverted uterus with large fibromyoma in fundus.

The following cases are typical of this group:

Case 1.—The patient had been in labor two days. Ineffectual efforts were made with forceps to extract what was believed to be the baby's head. A consultant recognized the nature of the difficulty and brought the patient 60 miles to New York. At operation a very large fibromyoma was found occupying the entire fundus of the uterus which was incarcerated in the pelvis. There was anterior sacculation of the uterus to accommodate the six and one-half months' fetus. Hysterotomy and hysterectomy were done. The patient made a good recovery save for a phlebitis. (Fig. 1.)

Case 2.—A twenty-four year old primigravida showed at term a large fibromyoma attached to the left anterior lower uterine segment. No symptoms from the tumor were described. Elective cesarean section and hysterectomy were done. The patient had a temperature of 105° for three days and thereafter convalesced normally. This case illustrates the anterior attachment of a pelvic tumor. The relatively narrow pedicle, the normal condition of the rest of the uterus, and the youth of the patient, suggest that myomectomy might have been attempted. (Fig. 2.)

Case 3.—The patient complained at five months of pain in lower abdomen, legs and back. The pain was intermittent, knife like, disabling, preventing sleep. Hysterectomy was done because the pain was not sufficiently relieved by rest in bed. Convalescence was uncomplicated. This case illustrates the type in which very large tumors require hysterectomy before viability because of severe pain unrelieved by rest in bed.

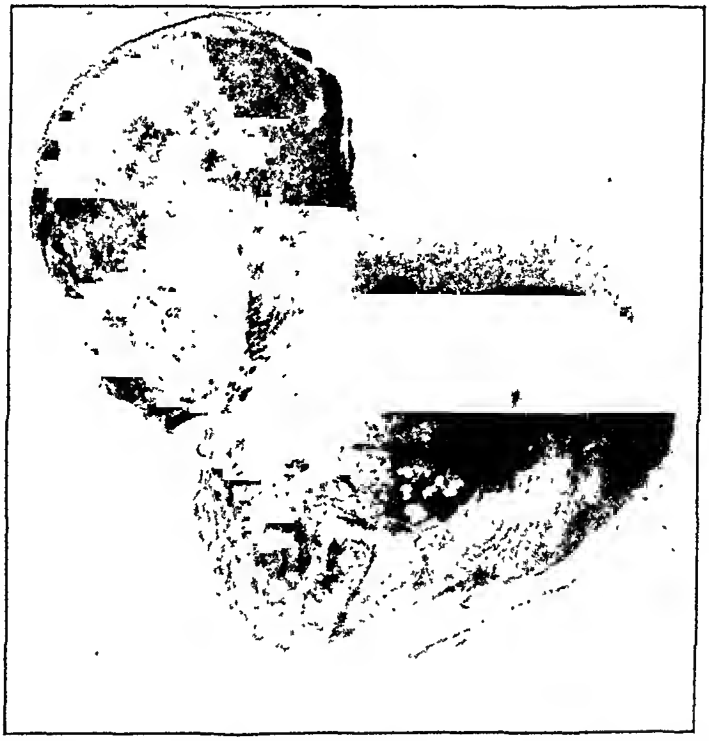

Fig. 2.—Hysterectomy for large obstructing fibromyoma attached anteriorly to lower uterine segment.

Case 4.—The patient complained at four and one-half months of severe left upper abdominal pain with distention and vomiting. A large, tender fibromyoma was found attached to the left horn of the uterus. She was kept in bed in the hospital for the remaining twelve weeks of her pregnancy. Pain and distention recurred frequently but were relieved by sedatives, poultices and colon irrigations. The hemoglobin dropped from 75 per cent to 44 per cent without external bleeding. Cesarean section followed by hysterectomy and appendectomy were done at term. The tumors were subperitoneal, intramural and intraligamentous. That in the left broad ligament measured 12 by 9 by 8, showed necrosis and peritoneal inflammatory reaction. The appendix was firmly adherent to the anterior aspect of the uterus. Convalescence was uncomplicated for mother and child. This case shows that patients with marked symptoms can sometimes be carried to term with a good result for mother and baby if they are kept in bed and treated symptomatically.

CASE 5.—A thirty-four year old primigravida, at three and one-half months, showed a large fibromyoma extending two inches above the umbilicus. There were no subjective symptoms. Her hemoglobin, however, was 37 per cent, RBC 3,500,000. The anemia may have been caused by badly infected teeth. These were extracted. With rest in bed, Blaud's Pills, and a transfusion, the red blood cells rose to 4,400,000 and hemoglobin to 52 per cent. Despite this improvement and the patient's desire for a baby, even at great inconvenience, hysterectomy was done. The belief was that the very large tumor would cause abortion anyway. Convalescence was uncomplicated.

This case is one in which difference of opinion may exist as to treatment. Many would agree that this woman .should have been given her chance to carry to viability or term. (Fig. 3.)

CASE 6.—A forty-two year old primigravida at term showed multiple, large fibromyomata without symptoms. Elective cesarean and hysterectomy were done. A large, spongelike, degenerated fibromyoma was found attached by a pedicle to the left horn of the uterus. Convalescence was uncomplicated. This case shows that complete degeneration of a pedicled fibromyoma may occur without causing urgent symptoms. (Fig. 4.)

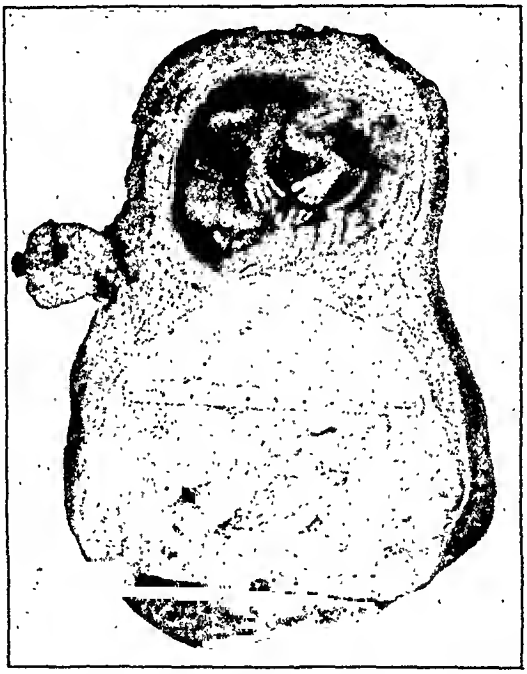

Fig. 3.—Hysterectomy at three and one half months, no compelling symptoms. Indication, large size of tumor.

CASE 7.—A thirty-one year old primigravida was found to have a small fibromyoma when first examined for sterility. Pregnancy followed. Threatened abortion with slight bleeding occurred at the third month and threatened premature labor, with bleeding, at the seventh and throughout the eighth month. At term there was marked albuminuria and anemia: Hgb. 35 per cent, RBC 2,360,000. Two transfusions were given. Labor was spontaneous and normal. The baby weighed seven pounds. There was marked abdominal pain and unusually severe after pains postpartum. On the fifth day, the lochia became foul and the uterine cramps worse. A large necrotic fibromyoma 12 cm. in diameter was removed from the vagina on the seventh day. Convalescence was normal thereafter. This case illustrates the sloughing and expulsion of a submucous fibromyoma in the puerperium.

CASE 8.—A thirty-six year old primigravida aborted spontaneously at five months. The placenta could not be expressed and attempts to remove it manually or with instruments failed because of a large fibroid in the lower uterine segment which prevented access to the uterine cavity. The cervix and vagina were packed with gauze. Twelve hours later the placenta was still retained so that hysterectomy was done. Examination of the uterus showed the placenta not adherent but held in the uterine cavity by a tumor blocking its exit. There was postoperative shock and a febrile course for twelve days, followed by recovery. Judgment of this case is difficult. It is hard to believe, since a five months' fetus had passed that the placenta could not have been removed. Yet two experienced operators were unsuccessful.

CASE 9.—A twenty-nine year old primigravida started to abort spontaneously at six months. A large fibromyoma was recognized in the lower uterine segment anteriorly. Uterine contractions were irregular and ineffectual. There was persistent, moderate bleeding from the uterus. A marginal placenta previa was recognized. A bag was placed in the cervix. When it came through, cord prolapsed, a version and extraction of a 30 cm. dead fetus was done. The uterus and vagina were packed with iodoform gauze. The patient ran a moderate febrile course with a fast pulse, moderate abdominal distention and tenderness over the uterus. These symptoms were interpreted as indicative of infection in the tumor. Hysterectomy and bilateral salpingo-oophorectomy were done on the seventh day. There was a small abscess involving the right tube and ovary, to which the appendix was adherent. There were signs of a pelvic peritonitis. The patient recovered from severe shock after twelve hours and made an uneventful recovery. The pathologist reported an acute inflammation of premature placenta, endometritis, right salpingitis, and peritonitis. Section of the tumor showed varying degrees of degeneration but no inflammation.

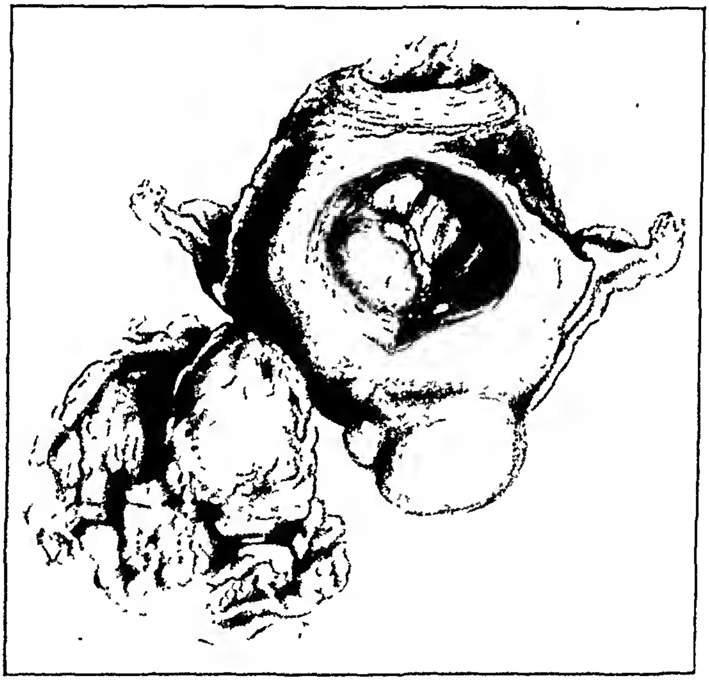

Fig. 4.—Complete degeneration of pedicled fibromyoma without marked symptoms. Hysterectomy at term.

The question brought up by this case is whether or not the presence of fibromyomata in infected puerperal uteri justifies hysterectomy. The treatment of puerperal uterine infection in general by hysterectomy has no standing. The pathology reported in this case suggests little reason for so radical a departure from the accepted teaching. Yet the patient after a critical twelve hours recovered splendidly, more quickly than would have been expected with conservative treatment.

Consideration of these cases suggests the question whether or not interference was always justified. Many would agree that the five myomectomies during pregnancy were ill advised. Even if allowed to go to term, however, it is probable that four of those cases would have required major operative interference. The necessity of two of the hysterectomies before viability, in cases without compelling symptoms of pain, bleeding or pressure, could be questioned, for opinion is strong in the literature that conservatism should be practiced. No operation is justified by the fear of symptoms or complications which may arise but only by urgent ones that actually have appeared.

6. MATERNAL MORTALITY

Eight of the 250 women (3.2 per cent) died. Necropsy showed that one of these women died of an acute bronchopneumonia following a normal labor and delivery. There is, therefore, a mortality due to obstetric causes of seven of 250 (2.08 per cent). Cragin and Ryder reported a gross maternal mortality of 3.3 per cent (89 cases); Pinard 3.6 per cent, Lobenstine 4 per cent (100).

The clinical histories of the fatal cases follow:

CASE 1.—The patient showed at term, before labor, an obstructing fibroid. A large necrotic fibroid was removed *per vaginam*, the colpotomy wound being packed with iodoform gauze. Membranes ruptured spontaneously three days later. A nine hour labor with frank breech delivery of a stillborn fetus followed. The patient died of pelvic and general peritonitis.

At the present day vaginal myomectomy would not be done and spontaneous trial labor would be permitted to determine whether or not the pelvic tumor would withdraw or could be pushed out of the pelvis. Failing to dispose of the obstructing tumor, abdominal cesarean section would be done followed by myomectomy or hysterectomy.

CASE 2.—A thirty-six year old primigravida fell into spontaneous labor at term. She had a forty-six-hour labor, twenty-six hours with ruptured membranes. A bag was placed in the cervix to combat inertia and favor dilatation. Finally, cesarean section without myomectomy or hysterectomy was done. The indication given was "large child, flat pelvis, R. O. P., head high, no advance." The operator described the uterus as "studded with very many larger and smaller fibroid nodules, the largest, size of walnut—but uterus contracted well and there was little bleeding." The nine pound baby lived. The mother died of uterine sepsis and general peritonitis. The excessively prolonged labor and the use of the bag were not justified. An examination under anesthesia early in labor might have permitted the recognition of the fibromyomata and made more clear the other indications for cesarean. Most important of all, it is clear that a hysterectomy should have been done in view of the prolonged labor with vaginal interference, the pathology of the uterus, and the patient's age.

Case 2 represents a very important, though relatively uncommon, type; namely, that in which there are very numerous small fibromyomata throughout the uterus whose presence is not usually recognized until cesarean section is done. The following case history is a similar one which shows, in the good result for mother and baby, the wisdom of a more radical point of view in the treatment of such cases. A thirty-seven year old multipara had had one full term successful delivery by high forceps. In the present pregnancy she had moderate abdominal pain and bleeding from the uterus in the last month. At term, fibromyomata were not recognized, but the uterus was hard, the position a breech and difficult to make out. Because of these facts, the patient's age and obstetric history and the feeling that the uterus was abnormal, cesarean section and hysterectomy were done. The uterus was found to be studded throughout with small fibromyomata.

Case 3 was practically the same as Case 2. Cesarean section without hysterectomy was done after a prolonged labor with marked dystocia and vaginal interference. The patient died of uterine sepsis and peritonitis.

Case 4.—A thirty-nine year old patient was delivered by low forceps after a fifteen hour labor. Large intramural fibromyomata were noted. An adherent placenta was removed manually. No undue hemorrhage was noted during or soon after delivery. The uterus was packed several hours later, however, for persistent bleeding. The patient succumbed to hemorrhage and shock in six hours. This case shows the necessity of the most careful conduct of the third stage of labor and early postpartum period. In some cases prophylactic tamponade of the uterus and vagina is indicated.

Case 5.—A twenty-eight year old negress, gravida 2, showed a pedicled fibromyoma (16 by 15 by 10 cm.) attached to the six months' pregnant uterus just below the round ligament. The pedicle was 4 cm. long and 2 cm. wide. The tumor had given no symptoms, but had grown rapidly in one month's time, according to the patient, from the size of an egg at the level of the navel to extend almost to the ensiform. At laparotomy, omentum was found adherent to the fibromyoma. There was profuse bleeding from the uterine wound, but this was controlled by suture. Signs of increasing intestinal obstruction followed operation, and there was disruption of the abdominal wound on the fifth day after operation. The intestines were replaced in the peritoneal cavity and the wound closed, but the patient died the next day. This case with its large, rapidly growing fibromyoma attached to the uterus by a narrow pedicle is one in which myomectomy is to be considered. Yet this patient presented no imperative indication (bleeding, pain or pressure) for operation. Myomectomy was done because of the fear of what the tumor might do, not because it was actually causing important symptoms. The literature shows the concensus of opinion to be that myomectomy is ill advised during pregnancy, giving bad results for mother and baby. Lockyer quotes Troell who reported 157 conservative myomectomies (100 for various symptoms, in 57 no symptoms stated) during pregnancy. The fetal mortality was 23.9 per cent and maternal mortality was 3.9 per cent. The average fetal mortality in women with myomata is given by Troell as about 20 per cent and his comment is that by putting the mother to the danger of this operation we gain nothing in the interest of the child. In the present series, five myomectomies were done during pregnancy with the death of two mothers and all but one of the fetuses.

Case 6.—A twenty-one year old primigravida had had a myomectomy for fibromyomata two years before the present pregnancy. Cesarean section was done at term after a few first stage uterine contractions. The operator gave his indication as follows: "Previous operation had split uterus in anterior wall to remove fibroid polyp from interior. After consultation it was decided that cesarean was indicated because of danger of rupture of previous scars." The surgeon found at operation "a dense sheet of adhesions covering entire anterior wall of uterus and both tubes and ovaries." There was considerable bleeding after removal of placenta and membranes. The uterus was packed with iodoform gauze and pituitrin given. It contracted fairly well. Hysterectomy was not done because of anticipated difficulty from the extensive adhesions. The patient took her anesthetic badly throughout. The adhesions were left alone. The uterus was restored to the abdominal cavity with great difficulty. A single small fibromyoma was enucleated from the uterine wound. The eight pound baby survived. The mother died of shock and hemorrhage five hours later.

The one small surviving fibromyoma in the uterus had nothing to do with the clinical disaster. It serves, however, to bring up for discussion the treatment of these most troublesome cases; namely, those in which the uterus has been subjected to multiple incisions for fibromyomata and in which, consequently, there is feared during subsequent labor the dangers to mother and child of uterine inertia on the one hand and rupture of the uterus on the other. There are no cases on record at the Sloane of the latter complication. Moreover, the researches of Williams[5] and Gamble,[6] on uterine wound healing after cesarean section, and those of Wilson[7] on the incidence of rupture of the uterus in labor subsequent to cesarean section, suggest that the danger of rupture of the uterus during labor is not great after myomectomy.

The Sloane cases of pregnancy after myomectomy are not available for this report. It is our impression, however, that the incidence of dystocia from uterine inertia is considerable. The danger in such instances is of course greater for the child than for the mother. The clinical history just detailed shows the danger to the mother of cesarean section. There is probably an increased morbidity and mortality in such cases due to the extensive peritoneal adhesions which are often present and prevent contraction of the uterus and allow hemorrhage.

No precise conclusions are possible from these observations. It is our opinion, however, that a conservative policy should be followed in such cases and that cesarean section should not be done unless there are indications in addition to that of the former myomectomy.

The other two maternal deaths were attributed in one case to acute bronchopneumonia, and in the other to hemorrhage from a cervix badly lacerated from a precipitate delivery.

7. FETAL MORTALITY

The gross fetal mortality in 191 pregnancies with fibromyomata was 35.6 per cent (64 of 193). Cragin and Ryder reported 34.8 per cent, Pinard 32.6 per cent and Lobenstine 21 per cent. Yet textbooks do not emphasize fetal prognosis or mortality in their discussion of fibromyomata and pregnancy. As stated before, they give the impression repeatedly that fibromyomata are relatively harmless. How differently an internist or surgeon would react to the conduct of a clinical problem in which there was a mortality of 35 per cent!

Study of the records showed that the fibromyomata were probably clinically responsible for 40 (60.20 per cent) of the 64 fetal deaths. This gives a corrected fetal mortality due to the fibromyomata themselves of 20.7 per cent. The chief cause of this fetal mortality was prematurity (37 of the 40 babies lost, because of the disturbing fibromyomata, were premature).

No further facts are necessary to indicate the wisdom of giving to the parents a guarded prognosis for the baby in all cases of pregnancy and fibromyomata. The obstetrician, on his part, must exert every effort to carry these patients to term thereby reducing to an important degree the fetal mortality from prematurity.

SUMMARY AND CONCLUSIONS

1. The incidence of clinically important fibromyomata, 191 in 30,836 consecutive pregnancies, was 0.6 per cent, of which 15 per cent were in the pelvis.

2. Spontaneous abortion or premature labor occurred in 24.1 per cent of the cases.

3. The incidence of important obstetric abnormalities and complications is markedly increased by fibromyomata.

4. Major operative interference was necessary because of the fibromyomata in 21.4 per cent of the 191 cases (42 of 191). It was necessary in 73 per cent of the 30 pelvic cases.

5. The gross maternal mortality was 3.2 per cent (8 of 250). The mortality due to obstetric causes was 2.08 per cent.

6. The gross fetal mortality was 35.6 per cent (64 of 193). The mortality for cases in which the fibromyomata were probably responsible was 20.7 per cent. Prematurity was the chief cause of fetal death.

7. The literature does not sufficiently emphasize the danger of fibromyomata to mother and baby, particularly to the latter.

8. During pregnancy special effort should be made to prevent abortion and premature labor. Interference is indicated only by the appearance of severe symptoms of pain, bleeding, or pressure, which do not yield to treatment. At term a test of labor is often desirable.

During labor if obstruction from the tumor persists, or other varieties of dystocia are marked, cesarean section should be done with myomectomy or hysterectomy, according to the indications. The third stage of labor requires particular attention to prevent hemorrhage from a poorly contracting uterus.

In the puerperium, fibromyomata may undergo degeneration and necrosis. They may slough into the uterine cavity and become infected. Where signs and symptoms point to the tumor itself as being primarily affected radical surgery is indicated. Where, however, the tumors are simply included in a general morbid process (such as an acute uterine infection), radical interference is not so clearly indicated.

REFERENCES

(1) *Cragin and Ryder:* Obstetrics, New York, 1916, Lea & Febiger. (2) *Pinard, A.:* Fibromes et Grossesse, Ann d. gynec. et obstet., 1901, iv, 165. (3) *Lobenstine, R. W.:* Fibromyomata of the Uterus, Complicating Pregnancy, Labor and the Puerperium, Transactions of the American Association of Obstetricians and Gynecologists, xxiii, 1910, 371-398. (4) *Lockyer, Cuthbert:* Fibroids and Allied Tumors, London, 1918, Macmillan and Co. (5) *Williams, J. Whitridge:* Bulletin Johns Hopkins Hospital, 1917, xxviii, 335. (6) *Gamble, Thomas O.:* Bull. Johns Hopkins Hosp., 1922, xxxiii, 93. (7) *Wilson, Karl M.:* A Clinical Study of 133 Pregnancies Following Cesarean Section, Am. Jour. Obst. and Gynec., 1926, xii, 268.

(For discussion, see page 391.)

PERIODICITY OF SEX DESIRE

PART II. MARRIED WOMEN

By Katharine Bement Davis, Ph.D., New York, N. Y.

AT THE end of our paper on "Periodicity of Sex Desire"[1] based on the replies of 1000 unmarried college graduates to a questionnaire on the sex life of normal women, we referred to the fact that our material on the same topic gathered from the questionnaire to married women was not as full nor in some ways as satisfactory as that received from the unmarried. This is due in part at least to the form and arrangement of the questionnaire itself. That for unmarried women is divided into sections on a basis of subject matter, while that for married women is on a basis of age and status.

In both, Section I deals with General Information designed to give us not only certain definite details of age, education, occupation, etc., but to orient us as to the type of woman replying.

In the unmarried women's questionnaire, Section II deals with Sex Information and Sex Instruction; Section III with Sex Feeling and Sex Experience; Section IV with Sex Problems; and Section V with Opinions.

In the married women's questionnaire, Section II deals with childhood to fourteen years; Section III, fourteen years to marriage; Section IV, marriage; and Section V with women who have passed the menopause.

In the unmarried women's questionnaire the questions concerning sex desire and its relation to the menstrual period naturally come under Section III, Sex Feeling, while in the married women's questionnaire they were placed under the section dealing with experiences from fourteen years *up to marriage.* Unfortunately no questions relating to this particular point were placed in the section dealing with marriage and only in a few instances did the women in their replies state in what way if any their feelings were changed by marriage.

It seems quite possible that marital experiences may have blunted the memories of what went before and that this may account at least partially for the much smaller number who report that they recognized periodicity of desire.

The questions concerning periodicity of sex desire and its relation to the menstrual period, as they appeared in the questionnaire for married women are as follows:

Section III. *Fourteen years to marriage*

1. Did you experience any strong sex feelings or desires during girlhood? (From age fourteen to marriage: e.g., excitation of organs; craving for self-induced sex pleasure; sex intercourse with a man.) If so, describe their nature.

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[1] Am. Jour. Obst. and Gynec., December, 1926, Vol. xii, No. 6, p. 824.

2. Did these desires (if any) arise at more or less regular periods? If so:
   (a) How many such marked periods of desire did you have in the time between menstruations (monthly sickness)?
   (b) What relation, in time, did they have to your menstrual period (during; before; after; how long before or after)?
   (c) If you had more than one such wave of desire between menstruations, were they of equal or different intensity and duration? How far apart were they? How long did they continue?
   (d) Were these periods of desire (if any) strong enough to produce temptation to sex indulgence?
   To diminish resistance to temptation?

Table I answers the first question.

TABLE I. SEX FEELING DURING GIRLHOOD

SECTION III. 1.		
Entire question unanswered	43	
"Do not remember"	6	49
Deny any sex feeling or desire during girlhood		582
Admit sex feeling or desire before marriage		369
	Total	1000

NATURE OF FEELING

Unanswered	19
Spontaneous excitation of organs	193
Craving for self-indulged sex pleasure	128
[1]Craving for sex-intercourse with a man	61
All three	9
Desire for brutal handling	2
Desire for love-making	3
	396[2]

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[1] Only after engagement - - - - - - - - - - - - - - - - - - 21

[2] Of these 46 mention two of the three desires.

It will be noted that 369 recall such feelings. The answers of this group to question 2 are shown in Table II.

TABLE II

Have observed sex feeling during girlhood		369
Have observed regular periodicity	126	
Have observed irregular periodicity	45	
Have observed no periodicity	176	
Unanswered	22	
	369	

It will be noted that only 126 of the 369 observed regular periodicity, while 45 others observed a periodicity which did not occur every month.

In answer to question 2(a), we have the results shown in Table III.

TABLE III. NUMBER OF PERIODS OF DESIRE BETWEEN MENSTRUAL PERIODS

SECTION III 2. (a)		
1 period		69
2 periods		22
One or two	10	
"One or more"	1	
One to three	1	
One to four	1	
Two or three	4	
Three	3	
Three or four	3	
Five	1	
"Several"	6	
Daily	5	35
		126

Omitting for the moment the consideration of the relation of periodicity to the menstrual period, we observe that question 2 (c) of Section III was quite generally ignored or misunderstood. So few of the 126 who observed periodicity attempted any reply that no comments are worth while. The answers to 2 (d) are shown as follows:

Was desire strong enough to produce temptation to sex indulgence?

Yes	66
No	40
Unanswered	20
	126

To diminish resistance to temptation?

Yes	43
No	19
Unanswered	64
	126

Following the order of presentation adopted in Part I of this paper, we will consider next the relation of periodicity of desire to the menstrual period and the relative frequency with which "before," "during," "after" or "midway" is mentioned. Table IV presents this relation in the 126 cases which recognize definite periodicity.

It will be observed from the totals that the difference in percentages between those who say "before" and those who say "after" is negligible. This is not the case with the unmarried group where it is shown in Part I that the ratio is as 4 to 3.

In addition to the 126 women who observed regular periodicity, 45 others had noted a periodicity which occurred at "less regular intervals," that is, not every month.

The relation of these desires to the menstrual period is shown in Table V.

The numbers in this group are too small for mathematic treatment. It is interesting, however, to note that while there is little difference in the proportions of those who say "before" and "after," as is the case with the group shown in Table IV, the percentage of those who mention "during" is very considerably higher. What, if anything, is the significance of this it is impossible to say.

From the group of 126 observing relative periodicity, we have selected 76 cases which place the date of the periods of desire so definitely that it is possible to chart them. The method is that used in Part I, Unmarried Women.

The circle, Chart I, divided into 28 segments, represents the lunar month. Four days are taken for the menstrual period, and the week preceding and the week following are indicated. We have arbitrarily assumed the menstrual cycle to be twenty-eight days and the average

TABLE IV. [1]PERIODICITY OF DESIRE WITH REFERENCE TO THE MENSTRUAL PERIOD

NUMBER OF PERIODS	BEFORE	DURING	AFTER	MIDWAY	COMMENTS
One					
69	30	1	20	3	
		6 and	6		
	5	or	5		
	1 and	1			
	1 or	1			
	2 and	2 and	2		
Two					
	19	and	19		
22			2 and	2	About 2 weeks after first period.
	1 and	1 or	1	1	
Three					
3	1 (1)	and	1 and	1	(1) Midway period strongest
	1 and		1 and	1	
	1 (2) and	1 and	1		(2) Hard to tell whether she means (1) continuous or (3) separate periods.
One or two					
10	2 (1)				(1) Second period only occasionally.
	1 (1)	1 and	1		
			1 (2)		(2) Both after—first always and most intense; second occasionally and within same week.
	1		1 (3)		(3) Always after—sometimes before also. No explanation as to which is more usual.
	1 (4)				
	1 (4)	1			(4) Always before—during occasionally.
	1 (5)		1		(5) Always before—after occasionally.
	1 (6)	or	1	1	(6) May come at any of these times but never during.
	One person replied: "One or two always," but does not place with reference to menstrual period.				
Two or three	1 (1)		1		(1) Two or three occur within the week before or the week after.
4			1 (2)		(2) Within one to two weeks after.
	1 (3)		1		(3) Right after and within week before.
	1 (4)		1	1	(4) At about one to two weeks' intervals.

TABLE IV—CONT'D

NUMBER OF PERIODS	BEFORE	DURING	AFTER	MIDWAY	COMMENTS
Three or four 3		1 (1)	1		(1) Toward the last of the period and in the week following.
	1 (2)		1		(2) Desire most intense just before.
	1 (3)		1		(3) Very seldom before—after about a week apart if satisfied do not come closer together.
"One or more" 1	1 (1)				(1) Most intense just before.
One to three 1	1		1		
One to four 1	1 (1)	1	1	1	(1) Just before always. The others may come about a week apart.
Five 1	1 (1)		1	1	(1) During the period of from 10 to 18 days after.
Several 6	2				
	1 (1)		1		(1) Only occasionally and faint.
	1 (2)		1	1	(2) May come in intervening weeks.
	1	1 (3)	1		(3) Toward very end of period sometimes.
	1	1 (4)	1		(4) Most intense after; sometimes only at end of period.
Daily 5	1 (1)		1		(1) Strongest just before and just after.
			2 (2)		(2) Strongest just after.
	1 (3)	1	1		(3) Strongest just before, during and after.
	1 (4)		1	1	(4) With the exception of during and a day or two after.
Total 126	88 42.9%	20 9.7%	83 40.4%	14 6.7%	205

*Where a figure appears in two columns connected by the word "and", as for example, "6 and 6" in the two columns headed "during" and "after," it means that six individuals state that they have a period of desire beginning during menstruation and extending a day or more into the time following. "Or" connecting two figures means that the desire may come at one time or the other.

TABLE V. RELATION OF DESIRE TO MENSTRUAL PERIOD OF THOSE WHO DO NOT RECOGNIZE MONTHLY PERIODICITY

BEFORE	DURING	AFTER	MIDWAY	COMMENTS
11 (1) (2)	5(3) (4)	9		(1) Two comment on dreams. (2) One person tries to lessen feeling by working late.
1 or	1			(3) One "feels very languid and eager for spooning at this time."
1 and	1			
4 (5)	or	4		(4) One comments on day-dreams.
5	and	5		(5) One says: "am easily thrilled by men."
	5 and	5		
	1	and	1	
3 and	3 and	3		
25	16	26	1	Total 68
36.7%	23.5%	38.2%	1.5%	

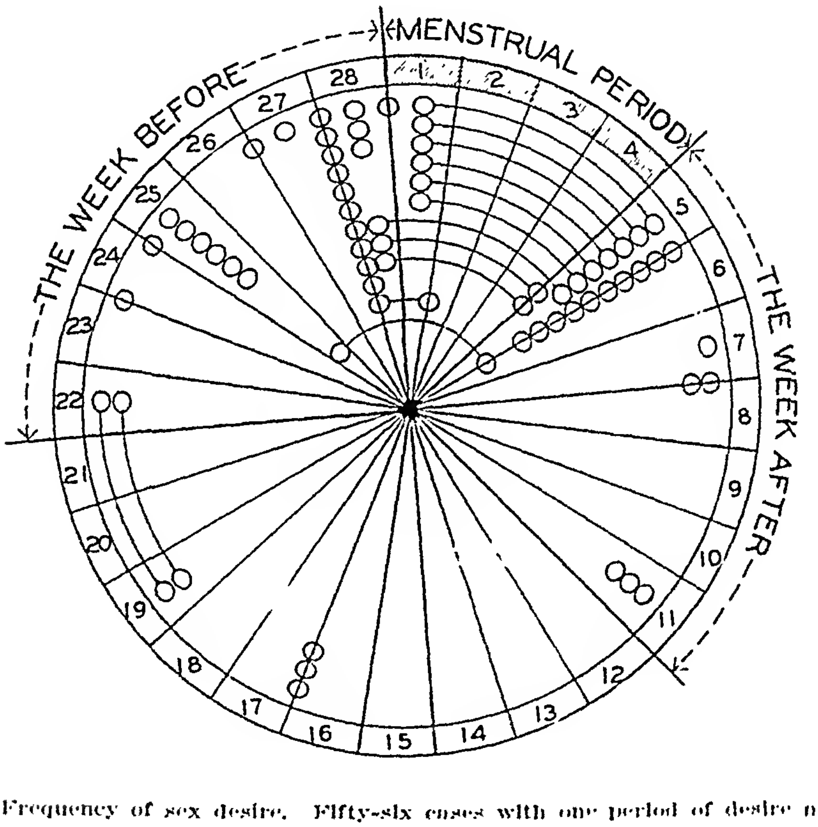

Chart I. Frequency of sex desire. Fifty-six cases with one period of desire monthly.

menstrual period to be four days. Work under way by a number of investigators may show that neither assumption is exact. For the *presentation of our data it serves well enough.*

Chart I presents 56 cases of one period of desire monthly. The 56 circles represent the dates in relation to the menstrual period. If a statement reads, "one or two days before," the circle is placed on the line between the dates. When a statement reads, "six days before," the circle is placed in the sixth segment preceding the one marked one. Where a statement reads, "beginning in the menstrual period and continuing into the day following," two circles connected by a line indicate this condition.

It will be noted that as in the case of the unmarried women, the very large proportion of dates given fall within a period included in the week before the menstrual period, the period itself and the two days following it.

Chart II presents twenty cases where two definite periods are named. The black circles are numbered; for example, there will be two black circles bearing the figure 1. These are the two dates given by the first member of this group.

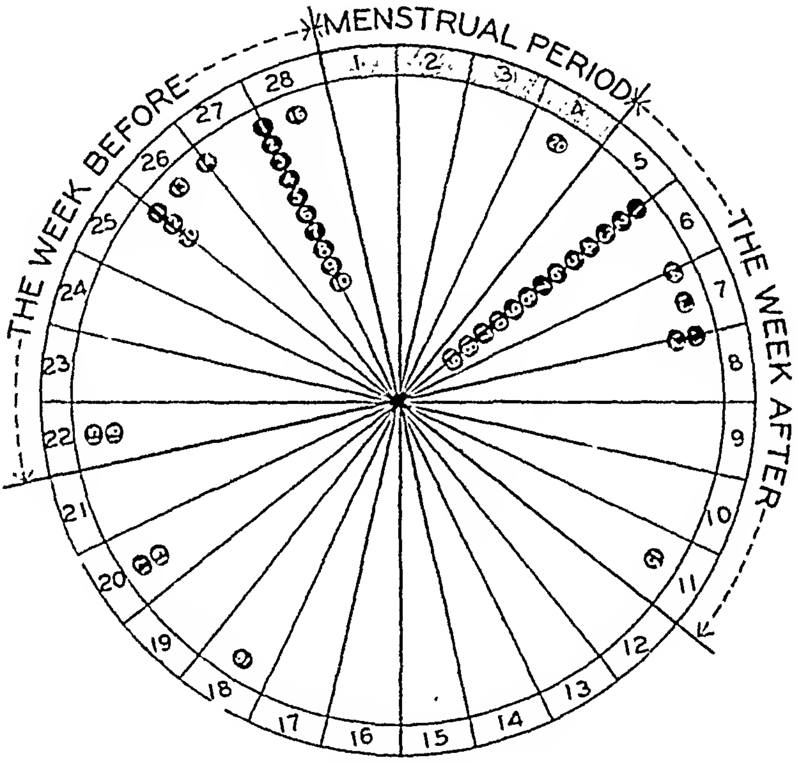

Chart II. Frequency of sex desire. Twenty cases with two periods of desire monthly.

As in Chart I, the bulk of the circles occur within a limit of eighteen days, only 3 cases being dated outside this limit. Chart III shows the combined groups.

Only 7 circles, or 7.3 per cent of the entire number, fall outside the eighteen days referred to above.

Chart IV is a combination of Charts III in Parts I and II of this study.

It represents the data presented on the two charts from the 110 unmarried and the 76 married women, with the addition of 14 cases not included in the remainder of the study, thus bringing the total cases considered up to two hundred. Of the 14 cases added, 4 were married and 10 unmarried women. The white circles represent the

126 cases with one period of desire and the black circles the 74 cases with two periods. Thus there are 274 circles on the chart. Only 8 of the 126 white circles fall within the period from the seventh day after menstruation to the seventh day before. Twenty-one of the black circles representing one of the two periods of desire in the 74 cases fall within the same limits. In no case do two periods of desire for the same individual fall within this limit. About 60 per cent of the circles are found within the period of two days before to two days after menstruation; 274 circles, or 5 per cent, are in the week preceding, and 86, or 31 per cent, are in the week following the period.

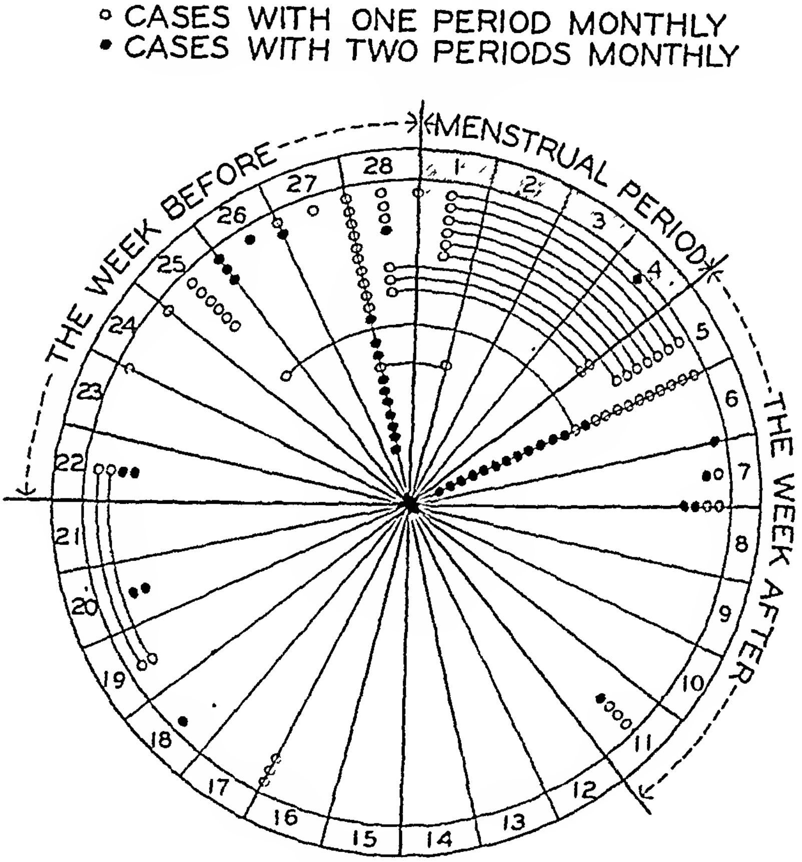

Chart III. Frequency of sex desire. Seventy-six cases.

The practical coincidence in women of the period of maximum desire with the period of maximum fertility is generally accepted. During the last ten or twelve years, there has been a good deal of work done on the most probable time for the occurrence of conception. The subject has been approached from different directions, such as the studies of pregnancies resulting from isolated coitus by Siegel, Zangemeister, and others; ovulation in its relation to menstruation has been studied in abdominal operations by several surgeons such as Schroeder, Ruge and Fraenkel. Other investigators are at work on the same subject from other points of approach, notably, Frank, Papanicolaou and Jessie King.

I have been permitted to examine a collection of data on this subject prepared by Dr. Robert L. Dickinson. From this it would appear that while pregnancy may occur at any part of the menstrual cycle, it is most likely to occur in the week following the menstrual period. This coincides with the period of desire of *second* greatest frequency shown in Chart IV. Furthermore, the studies quoted above seem to show that in our group of 200 cases, the time of highest frequency of sex desire coincides with the period of least likelihood of conception.

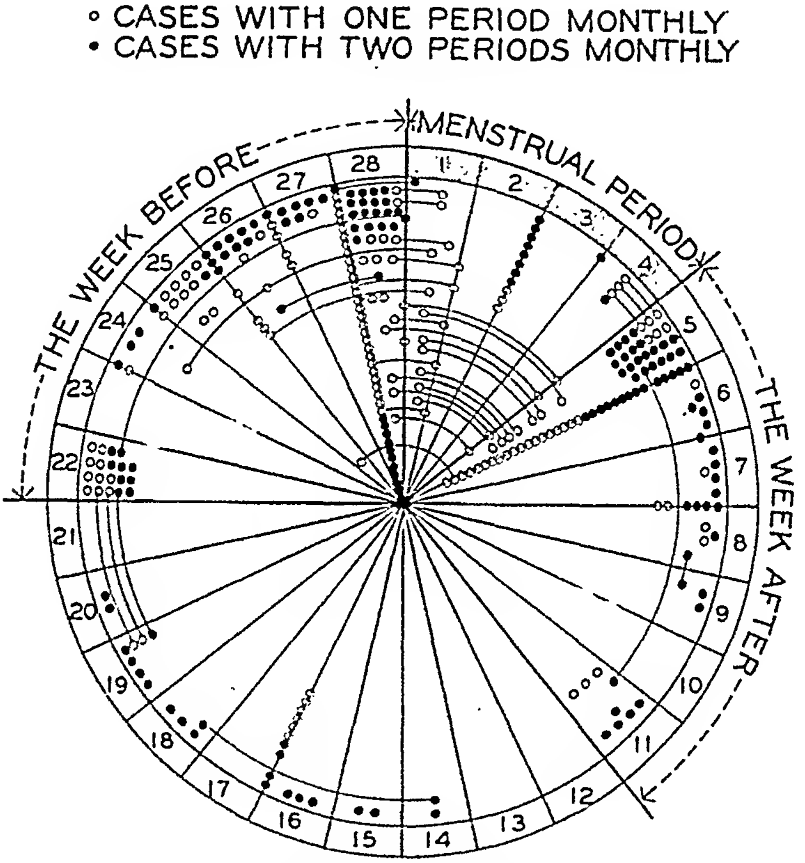

Chart IV. Periodicity of sex desire. 200 cases. Combined chart—110 unmarried and 76 married women—with the addition of 14 cases, 4 married and 10 unmarried not included in the remainder of the study.

CORRELATIONS AND COMPARISONS WITH THE UNMARRIED WOMEN'S GROUP

As in Part I of this study (Unmarried Women), certain correlations have been made to discover in what ways, if any, this group of women who observe periodicity of desire differ from the total group. The same correlations have not all been made in Part II, inasmuch as the material available was not identical. For the sake of comparison, they have been made wherever possible.*

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*In these correlations the subgroups into which the 126 cases of regular periodicity might be broken up give too small numbers to be treated statistically.

1. *Age.*—The average of the total group of married women is 38.3 years. That of the group recognizing periodicity is 36.5 years. The difference is too small to be significant as was the case with the unmarried women where the figures were 37.4 years and 36.8 years respectively.

2. *First Remembrance of Sex Feelings.*—The questionnaires for married and unmarried women were not identical. For the latter the questions were grouped topically. Those relating to sex feeling began as follows:

> A. *Sex Feeling.* Section III.
>
> 1. (a) Do you recall having had any sex feelings or impulses during childhood (up to beginning of menstruation)? Spontaneous (physiologic) excitation of organs; pleasure in handling organs; desire for sex excitement; sex day dreams; curiosity about sex affairs of parents or other adults; strong attraction for boys and men; any other?

The questionnaire for married women was divided into age periods. Under Section B, Childhood to Fourteen Years, question 8 reads:

> 8. Do you recall having had any sex feelings or impulses during childhood? (Up to about fourteen; pleasure in handling organs; excitation of organs; desire for sex excitement; sex day dreams; curiosity about sex affairs of parents or other adults; strong attraction to boys or men.)

There is a difference, it will be observed, in the time limit as menstruation does not occur in all cases at 14.

We find when we compare the numbers in the two groups of 1000 each of married and unmarried women, that the number recalling sex feeling in childhood is almost identical, being 461 for the married and 463 for the unmarried.

Comparing the total group of married with the 126 who observe regular periodicity of desire in respect to sex feeling in childhood, we find 461 or 48.1 per cent (41 of the 1000 failing to answer this question) among the former and 99 or 78.6 per cent among the latter group. This difference of 30 per cent is certainly significant and corroborates the findings in the case of the unmarried. It seems to indicate that where sex feeling as a child was sufficiently strong to be remembered, there is greater likelihood of periodicity of sex desire strong enough to come into consciousness.

3. *Sex Problems.*—In the questionnaire for married women there were no questions which definitely asked for the statement of sex problems, and although some qualitative material is presented by those answering other questions, it does not lend itself to statistic treatment.

4. *Education.*—The group of unmarried women were all college graduates. In the group of married women 68.1 per cent were college women.

In the group of 126 recognizing periodicity there were 82 women or 65 per cent who were college graduates. The difference of 4 per cent is not significant.

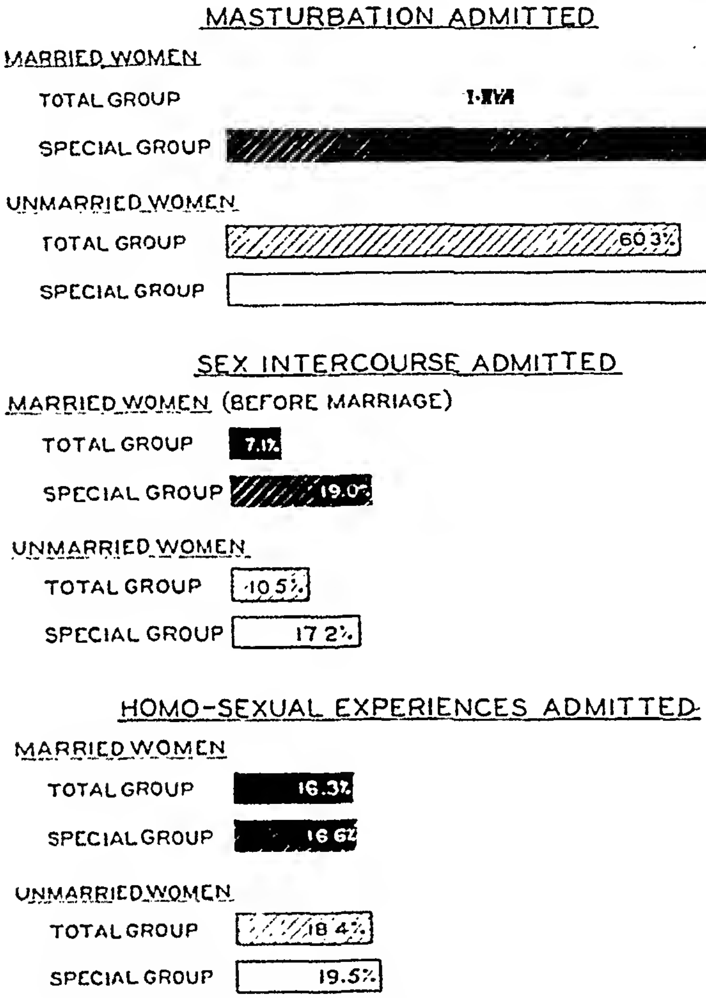

Chart V. Comparison of sex practices between total and special groups of married and unmarried women.

5. *Sex Experiences.*—In the comparison of the groups of married and unmarried as to sex experience, we have taken into account in the case of the married only those which preceded marriage. We find that while 65.9 per cent of the total group of the unmarried and 85.3 per cent of the special group admit sex gratification of some sort, among the married 48.6 per cent of the total group and 82.5 per cent of the special group make the admission. As to the significant difference between the two total groups, it should be borne in mind that the average age of the unmarried group is 37.4 years, while the average age at marriage of the married group is 25.7 years.

In the two groups which recognize periodicity, the percentages differ only by 2.8, which is not significant.

TABLE VI. AUTO- AND HETEROEROTIC PRACTICES PREVIOUS TO MARRIAGE

DESCRIPTION OF GROUP	MASTURBATION				HOMOSEXUAL EXPRESSION				SEX INTERCOURSE			
	TOTAL GROUP 1000		SPECIAL GROUP 126		TOTAL GROUP 1000		SPECIAL GROUP 126		TOTAL GROUP 1000		SPECIAL GROUP 126	
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
All sex expression unanswered	8	0.8	---	----	8	0.8	---	----	8	0.8	---	----
All sex expression denied	506	50.6	22	17.5	506	50.6	22	17.5	506	50.6	22	17.5
Special sex experience unanswered	49	4.9	---	----	34	3.4	8	6.5	67	6.7	33	26.00
Special sex experience denied	570	57.0	28	22.3	803	80.3	97	76.9	862	86.2	69	55.00
Special sex experience admitted	381	38.1	98	77.7	163	16.3	21	16.6	71	7.1	24	19.00
Totals	1000	100.0	126	100.0	1000	100.0	126	100.0	1000	100.0	126	100.00

In this table all percentages are based on the total number in each group.

TABLE VII. DISTRIBUTION OF CASES SHOWING ONE AND MORE THAN ONE TYPE OF SEX GRATIFICATION

	MASTURBATION NUMBER OF CASES		HOMOSEXUAL EXPRESSION NUMBER OF CASES		SEX INTERCOURSE NUMBER OF CASES		TOTALS			
							TOTAL GROUP		SPECIAL GROUP	
	TOTAL GROUP	SPECIAL GROUP	TOTAL GROUP	SPECIAL GROUP	TOTAL GROUP	SPECIAL GROUP	NO.	PER CENT	NO.	PER CENT
One type only of sex gratification admitted	267	65	83	1	20	5	370	76.1	71	68.2
Two types admitted	101 { 65 36	27 { 13 14	67 { 65 2	14	28 { 36 2	13	103	21.2	27	26.0
Three types admitted	13	6	13	6	13	6	13	2.7	6	5.8
Totals	381	98	163	21	71	24	486	100.0	104	100.0

Table VI presents the data concerning auto- and heteroerotic practices of the married women previous to marriage.

An examination of this table shows a significantly higher percentage in the group recognizing definite periodicity, both of those who admit masturbation and sex intercourse before marriage over those in the total group. This comparison does not hold with reference to homosexual practices. The percentages in this case differ by a negligible amount (16.3 per cent as against 16.6 per cent).

Taking the recognition of periodicity of desire as the sole determining factor, it is apparently of importance as a factor in masturbation, particularly in later life and in leading to sex intercourse before marriage.

In Table VII the special group is broken up into subgroups too small in numbers to be really significant, but it is interesting to note that the per cent is considerably smaller in this group for those having one experience and higher for those with two or three experiences.

Chart V presents a graphic comparison of the percentages of those admitting the various sex practices in the total group of married and unmarried women, and in the special groups of those recognizing regular periodicity.

In spite of the fact that the group recognizing regular periodicity is twice as large among the unmarried women, it is interesting to note that there is a negligible difference of percentages between the married and unmarried who indulge in sex practices, namely, masturbation 77.7 per cent and 77.2 per cent; sex intercourse 19 per cent and 17.2 per cent; homosexual experiences 16.6 and 19.5 respectively. The striking thing in this chart is the ocular presentation of the almost identical percentages of homosexual experience in the total and special groups of both married and unmarried women.[1]

6. *Health.*—In Part I of this study, Table XIV, health correlated with recognition of periodicity of sex desire shows that there is no significant difference between the total group and the group recognizing periodicity in the percentages of those whose health was good or excellent at the time of reporting.

Table VIII of the study of married women compares the health of the entire group before marriage[2] with that of the group of 126 recognizing regular periodicity.

Here it will be observed there is a difference of 11.4 per cent between the groups. Taking into account the size of the two groups, this is large enough to warrant the statement that the special group had significantly poorer health before marriage than the group as a whole.

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[1] Homosexuality will be treated at length in a forthcoming paper.

[2] We use "health before marriage" instead of "health at time of reporting" because the questions as to periodicity occur in the section of the questionnaire devoted to experiences before marriage.

It is fair to say, however, that the chances are greater in the case of the married women's group for misconceptions as to the time element, i.e., before or after marriage involved in the question of periodicity.

7. *Nervous Breakdowns.*—No definite question was asked in the married women's questionnaire on this particular point. In describing health before marriage, only 22 women cite nervous disorders. Where the definite question was asked of the unmarried, 301 women in the total group answered affirmatively as to nervous breakdowns or "near" breakdowns.

TABLE VIII. HEALTH BEFORE MARRIAGE CORRELATED WITH RECOGNITION OF DEFINITE PERIODICITY OF DESIRE

	SPECIAL GROUP 126		TOTAL GROUP 1000	
	NUMBER	PER CENT	NUMBER	PER CENT
Poor, very poor and fair	47	37.3	259	25.9
Good and excellent	79	62.7	741	74.1
Total	126	100.0	1000.0	100.0

Again we call attention in this connection to the fact that there was little difference in average age of the two groups at time of replying, —married women 38.3; unmarried 37.4, while the average age at marriage was 25.7 years.

8. *Pleasurableness of Initial Marriage Relationship.*—In a previous study we discussed the relationship of happiness of married life* and the pleasurableness of the marital relationship to the women. It was shown, for example, that in the group in which the initial relationship was pleasurable, there was a significantly higher percentage of happiness up to the time of reporting. In the present study we have examined the data to see if there is any relationship between the recognition of definite periodicity of desire before marriage and initial pleasurable experience in the marital relation.

A group of only 126 who recall definite periodicity is a small one on which to base a mathematic comparison, but we give the results as at least showing a trend.

Out of our total 1000, there were 655 out, or 65.5 per cent whose initial experience was pleasurable. Of the special group, 88 or 69.8 per cent reported pleasurable. The difference is 4.3 per cent. This is too small in itself to be significant. It may be the result of chance but it is an interesting possibility that there is a greater chance for pleasurable initial marital relations in the group which recognizes definite periodicity.

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*The Happiness of Married Life, Jour. Soc. Hyg., March, 1923, ix, No. 3.

If, however, we turn to the answers given to the question of the happiness of married life up to the time of report, we find that while 872 of the entire group, 88.2 per cent of those replying to the question, state that their married life has been happy, 107, or 86.2 per cent of our special group report enduring happiness.[*] That is, there is a lower rate of happiness in the 126 recognizing regular periodicity, though the difference is too small for definite conclusions.

Examining the reasons given in the sixteen cases where marriage was wholly or partially unsatisfactory, we find that in only two cases was it for reasons entirely apart from marital relations. In one instance the husband was an habitual drunkard, in the other he failed to support the family.

Among the reasons given in the fourteen other cases, is one case where the husband is unable to satisfy his wife sexually—(he is 23 years older). One husband is impotent; fear of pregnancy is cited in one case; husband "unable to perform the sex act properly," is given in one instance. In three cases the husband's demands are said to be excessive. One of the cases where the husband's moral outlook was changed in France during the World War belongs to this group, and in one instance the woman confesses that her own jealousy of her husband's attentions to other women makes her unhappy.

The 87.5 per cent of the total amount of unhappiness in this group due to sexual maladjustment is much higher than for the total group.[†]

CONCLUSION

As in the preceding papers, we do not undertake any interpretation of data. In this and the preceding paper on periodicity of sex desire we have classified, counted and correlated the answers given to the questions by 2000 well-educated women. As in all questionnaire studies of this type, we cannot go back of the returns. The papers themselves give evidence of honesty and careful consideration in replying.

It will be noted in this particular study that in a number of important correlations the data from the married women's questionnaire corroborates that obtained from the unmarried.

Two questions at least are raised which can only be answered by the work of competent investigators.

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[*] Two of this group did not answer this question and one replied "neutral."

[†] In the total group it is impossible to fix accurately the percentage due to sexual maladjustment for the reason that we cannot analyze those cases where "incompatibility" without further explanation is alleged to be the cause, but the number of cases is too small to make it more than suggestive. See *Happiness of Married Life*, Journal of Social Hygiene, April, 1922, and January, 1923.

First: Why should there be a relationship between periodicity of sex desire and both masturbation and sexual intercourse, and none between periodicity of desire and homosexual expression? And second: Is there any explanation for sex desire showing a maximum around the menstrual period, while from late studies ovulation seems to occur in what has perhaps unscientifically, been considered *the safe period?*

370 SEVENTH AVENUE.

THE DISADVANTAGES OF THE PROLONGED PERIOD OF POSTPARTUM REST IN BED*

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WILL a prolonged period of rest in bed, or the shorter one, after childbirth be of greatest benefit to the patient, in supporting nature to carry out the function of the puerperal state? Both sides of the question have their supporters.

In 1773 White wrote on the value of an early return of the puerperal mother to activity. He allowed his patients, i.e., the normal cases, to sit up in bed within the first 24 hours, and ordered them out of bed on the fourth day. He found that these early risers, invariably, made better recoveries, were in less want for therapeutic adjuvants, such as enemata, purgatives, catheterization, etc., for bowel stasis or inability to void.

Playfair, in his textbook on midwifery, published in 1879, promulgated the practice of prolonged stay in bed; arguing, that since the complete process of involution requires a period of two months, the period of rest in bed would have to be, as a natural deduction, a more or less prolonged one.

In 1899 Küstner, in his memorable work on this subject wherein he made a thorough study of a large group of cases, expressed a similar view to that of White. He believed, that with the recumbent posture, the uterus had a tendency to fall backward, towards the hollow of the sacrum, the lower segment thereby being forced downward and forward, thus placing the supporting ligaments on the stretch, and in this way predisposing to retroversion and prolapse. On the other hand, with the patient in the erect posture, the fundus of the uterus was thrust forward, being supported by the symphysis, while the cervix was naturally pointed and carried upward, towards the sacrum, thus relieving the tension on all the supporting ligaments. This position, he claimed, was the most favorable one for the process of involution of the uterus and its ligaments, and thereby guarded against the possibility of displacement after involution had been completed. By following up these cases he found that prolapse occurred less frequently in the patient who had a short period of rest in bed, than in the one who had a prolonged period of "Bettruhe."

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*Read at a meeting of the Section on Obstetrics and Gynecology, New York Academy of Medicine, January 25, 1927.

Von Alvensleben, in 1908, allowed a series of one hundred women, uncomplicated, to get out of bed from the first to the fourth day, postpartum. He found that these cases had better bowel movements, required less catheterizations, and had better muscle tonus, than those who had had a prolonged stay in bed. Only 10 of these cases were attended by fever, which he attributed to a demonstrable gonococcus infection. In the same year, Rosenfeld, citing 102 cases, one of which developed fever due to mastitis, allowed his patients to get up on the third day. He assumed, that since the etiology of prolapse was an atrophy of the pelvic floor, long rest in bed increased the muscular weakness. He therefore deduced, that the early use of these muscles predisposed to the restoration of the muscular tonus, and so made prolapse less frequent.

Halban and Tandler, in their anatomic treatise on the etiology of prolapse, believed, with Rosenfeld, that the main structural support in prevention of prolapse was the musculopelvic floor, centered about the levatores ani muscles. Twelve years later, Halban independently published his work, supplementing this theory, and asserted, that in addition to tho levators, the fascia endopelvina, with its many reduplications, was a most necessary structure in the support of the uterus. He did not believe that the levators, independent of the endopelvic fascia, were the all important factors in the prevention of prolapse. This latter view is the one that has received the widest acceptance among modern gynecologists. From the work of Küstner, Rosenfeld, and Halban, it can be seen, that with the early resumption of activity, the levators are returned to early function, while the erect posture favors the relaxation of tension on the ligaments, and so allows them to return to their pregravid state, more rapidly, than with the patient in the recumbent posture.

We desire to present a study of 446 cases, uncomplicated, with reference to the duration of rest in bed after confinement. What benefits we were to derive, we did not, in our unprejudiced minds, dare to foretell. We were not going to be buried in a world of empiricism; as proclaimed by DeLee: "One must hesitate long before allowing a principle, grounded in thousands of years of empiricism, to be overthrown by a new theory." He does not allow his patients to get out of bed before the ninth day.

Forestalled by this same empiricism accepted by the patients themselves, we at first had great difficulty in convincing them that their early rising would not be attended by some disaster. But, it required only a handful of more intelligent patients to lead the others on, and convince them that the attending dangers were nil and that, if anything, early rising was beneficial.

Out of the 446 patients one left the bed on the third day postpartum, six on the fourth day, 192 on the fifth day, 92 on the sixth day, 62 on the seventh day, 60 on the eighth day, 31 on the ninth day, and two on the tenth day. The average day out of bed of this group, was the sixth day. Prior to being ordered out of bed, each patient was allowed to move about within the first twenty-four hours, to sit up within the first forty-eight to seventy-two hours. One has only to refer to the work of Aschoff[1] on thrombosis, to realize the value of this early activity in bed, in the prevention of thrombosis with resultant emboli. With this DeLee[3] agrees, as does Williams,[14] quoted by Mosher.[8]

We have also made it a practice to allow a patient to sit up in bed within the first twenty-four hours, if she was not able to void spontaneously while in the recumbent posture; and to get out of bed on to a commode, or accompanied by a nurse to the bathroom, if she did not have a bowel movement within the first seventy-two hours. After twelve hours, Reuben Peterson, allows his patients to be swung out of bed on to a commode, if she had not voided by that time; even in cases where sutures had been taken.

The natural question one expects is: "What is your morbidity?" The answer, relatively speaking, is "a minimum." In this group of cases there were no untoward accidents of any kind. Embolism, the most dreaded of all accidents, was conspicuous by its absence.

Before we discuss the question of fever, let us call attention once again to the fact, that this group of 446 cases were all spontaneous deliveries, so-called normal cases. In all there were 27 cases of fever, a morbidity of 6 per cent. Of these nine entered the hospital with upper respiratory infections, making a net total of 18, or a net morbidity of 4 per cent. In 180 spontaneous labors, Carl Henry Davis,[2] noted 21 cases of fever, three of which presented respiratory infections on admission, making a gross and net morbidity of 11.6, and 10 per cent respectively. There were 5 cases on the first day, 1 on the second day, and 1 on the fourth day, that ran temperatures up to 100.4°. Above 100.4°, there were 3 on the first day, 9 on the second day, 5 on the third day, 2 on the fourth day, and 1 on the sixth day, postpartum. Among the causes for fever, besides the 9 cases of upper respiratory infection on admission, are: 1 case of retained lochia; 7 of acute mastitis; 5 of so-called caked breast; 1 of follicular tonsillitis; 1 of acute salpingitis (history of gonorrheal infection); 1 of bowel stasis, relieved by enemata; and 2 of secondary anemia, where there were postpartum hemorrhages, the patients ultimately recovering. The highest temperature was 105.2°, in a severe case of grippe.

CONCLUSIONS

The results that we obtained, after a year's observation, are on a parallel with those of White, Küstner, Von Alvensleben, etc. The well-being of the patient in the puerperal state, in uncomplicated labors, seems to vary inversely with the duration of the period of rest in bed. The use of the catheter is reduced to a minimum. Spontaneous evacuation of the bowel in the early rising patient has become more prevalent. The general muscular tonus has improved more rapidly, and approached the pregravid state in a much shorter period than is usually the case. The early rising of the patient seems to have quickened, rather than prolonged the involution of the uterus and its supporting structures. We believe that these good results follow the employment of an orthopedic principle, probably foreseen by Küstner and White, years ago, namely, that an injured muscle or fascia, with a minimum amount of rest, and the early introduction of passive and active motion, will sooner recover its normal tonus and strength, than the one which is subjected to a prolonged immobility, thus predisposing to atrophy and loss of tone.

In addition, early motion according to Aschoff, prevents venous stasis, thus precluding the possibility of thrombosis with resulting embolism. Aside from the pelvis itself, the rest of the musculoskeletal system of the patient benefits in a like manner, as do the blood-vascular and excretory systems. Morbidity, in the form of fever resulting from pelvic pathology, is decreased, rather than increased, by early rising, in uncomplicated cases.

REFERENCES

(1) *Aschoff, Ludwig:* Arch. Int. Med., Nov., 1913, pp. 503-525. (2) *Davis, Carl Henry:* Surg. Gynec. and Obst., Oct., 1926, p. 519. (3) *De Lee:* Practice of Obstetrics, ed. 4, Philadelphia, W. B. Saunders, 1924. (4) *Halban, Josef:* Operative Behandlung des weiblichen Genitalprolapsus unter berucksichtigung der Anatomie und Atiologie, Wien und Leipzig, 1919. (5) *Halban und Tandler:* Anatomie und Atiologie der Genitalprolapsus beim Weibe, 1907. (6) *Küstner, Otto:* Bettruhe. Verhandl. Deutsche path. Gesellsch. f. Gynäk., viii, 530. (7) *Markoe, J. W.:* Jour. Am. Med. Assn., Oct. 7, 1916, p. 1066. (8) *Mosher, G. C.:* Am. Jour. of Obst., 1911, lxiv, 617-625. (9) *Mullerheim, R.:* Berliner klin. Wchnschr., Nov. 8, 1909. (10) *Playfair, W. S.:* System of Midwifery, 1880. (11) *White:* The Treatment of the Pregnant and Puerperal Women, 1775, v, 304; Ac. of Med. N. Y., pp. 34-37. (12) *Rosenfeld, W.:* Gynäk. Rundschau, 1908, 21. (13) *Von Alvensleben:* Ztschr. f. Gynäk., Sept. 5, 1908. (14) *Williams, J. Whitridge:* Obstetrics, N. Y., 1921, D. Appleton & Co.

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THE DIFFERENTIAL DIAGNOSIS OF RIGHT-SIDED ABDOMINAL PAIN*

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EVERY acute abdominal condition is a potential catastrophe; every such condition which goes unrecognized or is handled by temporizing measures is an inevitable tragedy; and the basis of the successful management of all intraabdominal pathology lies primarily in prompt and accurate diagnosis. So incontrovertible are these facts that at first glance it might seem almost an impertinence for me to come before you tonight, in response to your kind invitation to address this Society, with another paper on the time-worn theme of the differential diagnosis of intraabdominal crises. On the other hand, as Sir Berkeley Moynihan once wisely pointed out in this same connection, much paper and much poverty may coexist, and it is not the settled problems of medicine about which much is written, but rather those matters upon which light still needs to be shed. I might add that nothing more clearly proves the need for light and still more light upon this special theme than a study of our formidable death rate in emergency surgery of the peritoneal cavity.

The blame for this state of affairs must be shared equally by the surgeons and the medical men. Too often the patient is referred to us in extremis, and we operate, not because we have any real expectation of saving his life, but simply because it is automatic with us to administer the last rites of our profession, as it were. For our own part, however, because it is so fatally easy to open the abdomen and investigate conditions within at first hand, we are too prone to operate on a haphazard diagnosis or none at all—I pass over with the scorn they deserve the pseudoaccurate diagnoses of the "acute abdomen" and the "surgical abdomen"—forgetting that the scientific practice of the art of surgery presupposes the identification of pathology and the fixing of indications before resort is had to the knife.

Chronic diseases of the peritoneal cavity need not concern us here. Since there is no need for haste, all the evidence in the case may be weighed, the history and physical findings may be studied in detail, laboratory examinations may be made as indicated, even the temporizing measures which should be heartily condemned when we are brought face to face with abdominal emergencies may be tried, and the course which is finally adopted is therefore likely to be, humanly speaking, the one best fitted to the needs of the case. In the acute condition, on the other hand, promptness of decision and action are all-important, there is no time for elaborate laboratory data to be secured, and an anguished patient and an anxious family all too often force one to supply the relief or to take the action which one's better considered judgment would emphatically forbid.

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*Read by invitation before the New Orleans Gynecological and Obstetrical Society February 10, 1927.

Practically every organ within the peritoneal cavity may be the seat of disease which, in some of its manifestations, at least, resembles the diseases which may arise in other similarly located organs. Thus we may have appendicitis, biliary pathology in its various phases; renal colic; displaced kidney; internal hernia; intussusception; volvulus; ordinary intestinal colic; acute pancreatitis; mesenteric thrombosis; renal and perirenal abscess; the rupture of any of the hollow viscera, as in gastric or duodenal ulcer, tubal gestation, or gall bladder diseases; torsion of the spleen or of an ovarian tumor; and such extraabdominal complications with referred abdominal pain as diaphragmatic pleurisy, frequently with associated pneumonia, acute osteomyelitis of the spine, and the gastric crisis of tabes dorsalis. Many of these, at first glance, carry on the surface the earmarks of their identity, but when the reports from various clinics are considered, it is evident that this is far from being the case. To cite but one instance, in one thousand cases of tabes dorsalis, surely a clear-cut clinical entity, exactly 10 per cent were operated upon during a gastric crisis for gastric ulcer, gallstones or appendicitis, which gives some idea of the confusion which exists, at least from the diagnostic standpoint.

In all of these diseases there is a definite, though often overlapping symptom complex, of which pain is the constant and outstanding feature. It is always of sudden onset and intense character, and most often, no matter where the true pathology is located, it originates in the region of the umbilicus. Pain which later radiates to the right iliac fossa suggests appendicitis. Pain which radiates to the right hypochondrium suggests gall bladder or liver pathology. Pain which radiates to the scrotum or testis in the male or to the labia in the female suggests some kidney condition. The pain of a ruptured tube eventually localizes in the true pelvis, as does the pain of simple tubal disease. Diaphragmatic pleurisy, liver abscess or gall bladder disease in which distention of the organ is a feature, frequently exhibits associated pain in the right shoulder blade, in addition to the abdominal pain. Moreover, the pain which arises from the rupture of a hollow viscus, as the stomach, the fallopian tube or the gall bladder, is immediate and agonizing in its intensity, while the acme of such conditions as intussusception, biliary colic, or the torsion or displacement of an organ or tumor is reached more gradually.

Vomiting characterizes practically all of these intraabdominal conditions, but the single act, occurring at the onset of the disaster, is of little significance. When it is repeated and continued it may signify anything from peritoneal irritation to complete intestinal obstruction, although true fecal vomiting occurs only in the final stages of obstruction of the large bowel or in the rare instances of gastrocolic fistula. In the late stages of peritonitis and in intestinal obstruction nausea does not accompany the act, as it does early in appendicitis, for instance, and the vomiting is little more than a mechanical regurgitation of the jejunal contents. Examination of the vomitus, however, may occasionally throw light on a doubtful condition.

Immediate collapse is not an initial feature of any of these conditions except tubal pregnancy. At a later stage it is especially marked in such conditions as acute pancreatitis, ruptured gastric or duodenal ulcer, and torsion of the spleen or of an ovarian tumor, and its appearance in acute inflammatory processes is the sign of a terminal and overwhelming toxemia. It might be well to comment, too, on the period of calm, frequently so dangerously misleading to the inexperienced, which follows the temporary collapse of the patient in ruptured ulcer or perforation of a gangrenous or ulcerative appendicitis, and which is always the precursor of peritonitis.

The degree of temperature is of little assistance. In practically all intraabdominal pathology it may be normal, elevated or subnormal, and my own experience is that it is most unusual to find any of these conditions exhibiting a temperature elevation of more than 101°. Elevation, it is true, is the rule in inflammatory processes, but it is a late and not an initial symptom, and more than once I have seen all degrees of pathology in the appendix, including gangrene, accompanied by no fever at all.

The pulse rate is of equally little assistance. As Moynihan has repeatedly pointed out, even in such catastrophes as the rupture of a viscus it may remain normal for some time afterwards, and while in ruptured tubal gestation it may swiftly become alarmingly rapid and weak, this is due to hemorrhage rather than to the tubal rupture. It is less affected in pelvic pathology than in appendicitis.

The localization of rigidity is always a sign of pathology in the underlying viscus, and is usually a most valuable diagnostic aid. It should always be supplemented by the endeavor to find the point of tenderness, "the area of supreme resistance," as Moynihan calls it, within the unyielding protective wall. In this connection, however, it should be remembered that a displaced organ may mean that this sign is absent, as when the appendix is in contact with the nondemonstrative area of the parietes. Similarly, a displacement may result in diagnostic error, as in a case of my own, operated on with a diagnosis of acute appendicitis, which proved to be acute cholecystitis, the ptosis being so extreme that the entire organ occupied the normal position of the appendix. Moreover, the fact of muscle fatigue, as studied by Cope, should not be lost sight of; he points out that fatigue of the reflex is a physiologic phenomenon which is bound to occur when a state of contraction has lasted beyond a certain length of time, so that the absence of local rigidity does not necessarily mean the absence of local pathology.

The presence of a distinct tumor mass is naturally a valuable aid to diagnosis, but only if it is constantly present can a definite neoplasm be diagnosed. Tumors which increase rapidly in size suggest a twisted tumor or organ, a localized abscess, or intraabdominal hemorrhage, while tumors which vary in size and consistency, and which tend to disappear and reappear, are practically always of intestinal origin, with their presence and absence dependent upon intestinal peristalsis.

How then, with this confusing array of duplicating and overlapping symptoms, is one to differentiate between the various abdominal conditions which constitute the bulk of our surgical emergencies? In the first place, certain general facts, many of them frankly based upon the laws of probability, must be borne in mind. Thus the age incidence of certain diseases is to be considered. Appendicitis does occur, though infrequently, in the extremes of age, but it is most usual during adolescence, and it is the most usual cause of an abdominal crisis during this period. Intussusception is most usual in very young children. Malignancy is the commonest cause of intestinal obstruction in adults of forty-five and over. Acute pancreatitis and acute biliary conditions, while they may occur in children, are most common in adult life. Ruptured ectopic pregnancy can occur only in women during the childbearing period.

Rather more obvious is the sex incidence. Such conditions as ruptured ectopic pregnancy, salpingitis, ruptured or twisted ovarian tumor, need obviously be looked for only in women. Large series of cases likewise prove that certain other conditions are more common in women than in men, as perforated gastric ulcer, biliary colic, torsion of the spleen, and displacement of the kidney, while acute pancreatitis, perforated duodenal ulcer and renal colic are more common in men, facts which are by no means universal but whose recollection may be helpful. I might say, too, that no woman should ever be subjected to laparotomy for a supposed intraabdominal lesion without a careful vaginal examination.

Experience likewise teaches us that certain diseases are prone to stage their onset rather definitely at certain hours. Acute appendicitis, for instance, commonly occurs in the early morning hours, waking the patient from sleep. Gall bladder colic tends to come on at midnight or thereabouts. Perforation of a gastric or duodenal ulcer occurs after meals, while torsion of an ovarian cyst, rupture of a tubal pregnancy and similar accidents are likely to happen in the daylight hours, particularly after unwonted exertion.

The so-called abdominal facies is a characteristic sign of such grave abdominal catastrophes as the rupture of a hollow viscus, the perforation of an appendix, and acute pancreatitis, while it is never apparent in such ephemeral conditions as intestinal or renal colic. Equally characteristic is the decubitus. The patient with acute appendicitis lies with his right leg drawn up, the patient with peritonitis lies with his knees raised, in an effort to relieve the abdominal tension. A patient suffering from some form of colic tosses restlessly about, seeking new positions to relieve his pain, and the patient with a ruptured tubal abortion also moves with the restlessness characteristic of loss of blood and air hunger. On the other hand, the patient with a ruptured hollow viscus lies rigid and motionless, afraid even to move a muscle. Asking the patient to turn over in bed and noting the manner in which he obeys is a simple method of determining in most instances the gravity of the condition which confronts you.

Pulse and temperature we have already commented upon as being unreliable guides, but they should never be overlooked, especially in children. The method of respiration should be observed particularly, to note whether it is of the thoracic or the abdominal type, and in obscure cases careful observation of the alae nasi may furnish the first clue to an early pneumonia. Frequently in abdominal conditions, however, the respiration rate may be increased, as a sort of compensation to the rigidity of the abdominal wall. Cope in this connection calls attention to the value of the ratio between pulse and respiration; normally 4 to 1, in respiratory disease it is materially reduced, and a ratio of 2 to 1 is a definite indication of pneumonia. Finally, an x-ray examination will frequently establish the differential diagnosis and reveal a central pneumonia, with signs not yet evident on auscultation, a condition, it might be added, which simulates appendicitis in adults as well as in children.

Laboratory examinations are sometimes of definite value. A blood count should be made, for instance, in every case in which appendicitis is suspected, though sometimes I am inclined to believe that Ochsner was right when he advised the surgeon to make a blood count, remove the appendix, and then look at the report. At any rate, in the average case of appendicitis the white count does not run above 14,000, with some 80 per cent of polymorphonuclears. Higher than this, it suggests pneumonia, or salpingitis. In the latter condition the white count is uniformly high, and in ectopic pregnancy, as Farrar has pointed out, it tends to fluctuate, decreasing as the hemorrhage is checked and the free blood absorbed. A urinalysis should be routine, not only to eliminate renal conditions which might contraindicate or limit surgery, and to decide the type of anesthesia to be employed, but also to eliminate renal calculi, and pyelitis, a possibility always to be considered in children and in pregnant women.

Most important of all diagnostic points is a carefully elicited and interpreted history. As Moynihan well puts it, "The catastrophes which occur within the abdomen are not, strictly speaking, 'acute'; they are, on the contrary, usually the result of abrupt transition from a quiescent to an acute phase in a disorder of long standing." Thus, to mention but a few instances, a history of similar previous attacks, perhaps milder, can usually be elicited in appendicitis in a young person, while the middle-aged or old patient will give a history of so-called dyspepsia. Previous jaundice is pathognomonic of gall bladder disease, a history of previous digestive disturbance is equally suggestive, while a history of gaseous distention or oppression in the epigastrium, definitely related to meals and relieved almost instantly by eructation or vomiting, is characteristic. Rapid loss of weight in a previously healthy individual is significant of malignant disease undergoing an acute inflammatory process, while intestinal tuberculosis may furnish the same symptom complex, although the progress of the lesion is less acute. A perforated gastric or duodenal ulcer has always given its warning, not only in a long train of digestive symptoms, but in recent exacerbations, and it has been frequently pointed out that the regularity of the occurrence of pain following the ingestion of food, upon which point the patient should always be interrogated, is sufficient to establish the diagnosis. In ectopic gestation the story of a supposedly normal pregnancy, or possibly even a slightly delayed period, frequently following a period of sterility, is characteristic. Even in acute pancreatitis, perhaps the most infrequent of these intraabdominal conditions, there can usually be elicited a story of vague discomfort or mild pain in the upper abdomen for some days previous.

Last of all, a diagnosis may usually be arrived at by exclusion, if all other methods fail. A definite mental rehearsal of all possible conditions, even the most unlikely, may be a mechanical procedure, I grant, but in more than one instance I have seen an obscure diagnosis cleared up by it when more scientific reasoning had not brought light.

Space does not permit an attempt to consider the diverse pathology of the peritoneal cavity in any detail. Practically every condition, however, offers at least one salient feature upon which to base a diagnosis. Thus appendicitis should never be diagnosed as such without the presence of initial pain. A ruptured gastric or duodenal ulcer is always characterized by board-like rigidity of the abdominal musculature. The replacement of the organ, with the mechanical correction of the hydronephros, confirms the diagnosis of misplaced kidney. The characteristic pelvic findings, supplementing the equally characteristic history of supposed pregnancy, sudden abdominal pain, collapse, and a fluctuating leucocytosis, warrant the diagnosis of ruptured tubal pregnancy. Pain in the right hypochondrium, with referred pain under the right shoulder blade, supplementing a history of digestive disturbances in an obese, middle-aged individual, definitely suggests cholecystitis. In this connection, however, I might mention my own chagrin in operating upon a woman whose history and pelvic findings were entirely typical of an ovarian cyst, with twisted pedicle, but who proved to have a ruptured gall bladder, the contents of which were entirely pelvic.

Finally, we might briefly comment upon the treatment of these conditions. It is fairly generally accepted that any pain which lasts more than six hours in a previously well person, especially when it is accompanied by vomiting, an increasing pulse rate, and the characteristic abdominal facies, demands surgical intervention. Never under any circumstances should purgation be given to these patients. I agree with Moynihan that many of the fatalities, I believe he says all, of acute appendicitis are due not to the disease itself but to the aperients administered in a mistaken effort to relieve the symptoms. Equally important, morphia and similar anodynes should not be given until the diagnosis is clearly established. More than once I have been called in consultation to see a case of intraabdominal disease in which every symptom had been masked in this manner, and in which I was obliged to make the diagnosis, in the absence of every characteristic physical sign, on the history alone.

Last of all, if in doubt, operate. I hold no brief for promiscuous surgery, but I firmly believe that less harm is done in the occasional doubtful case, in which every diagnostic effort has failed, by an exploratory incision—of sufficient length, however, to permit a view of the abdominal contents—than is done every day by the temporizing measures and the "wait and see" attitude of the inexperienced medical man and his brother, the faint-hearted and timorous surgeon.

SUMMARY

1. The high death rate in emergency surgery for acute abdominal conditions makes it evident that the scientific method of handling these diseases is yet to be universally applied.

2. Practically every organ of the peritoneal cavity may be the seat of disease which in symptoms and physical findings simulates the pathology of other intraabdominal organs.

3. Pain is a constant feature in all of these conditions; other variable symptoms include vomiting, elevation of temperature, acceleration of the pulse rate and changes in its quality, rigidity, and the presence of definite masses.

4. In making a diagnosis, the following points should be considered: age, sex, time of onset, facies and decubitus, variations in pulse,

temperature and respiration, blood count and urinalysis, and, most important of all, a carefully interpreted history. Diagnosis by exclusion is possible if all other methods fail.

5. In spite of the confused symptom complex which these conditions exhibit, each of them offers one or more salient features upon which at least a working diagnosis may be based.

6. Surgery is indicated in most acute intraabdominal disease. Purgation is never indicated, nor is the administration of opiates until after the exact diagnosis is established. Exploratory laparotomy is justifiable in the small percentage of cases in which an exact diagnosis cannot be made.

REFERENCES

Cope, Z.: The Early Diagnosis of the Acute Abdomen, ed. 3, London Oxford Medical Publications, Oxford University Press, 1925. *Cope, Z.:* Clinical Researches in Acute Abdominal Disease, London Oxford Medical Publications, Oxford University Press, 1925. *Gould, A. P.:* Elements of Surgical Diagnosis, ed. 5, New York, P. B. Hoeber, 1920. *Moynihan, G. B. A.:* Essays on Surgical Subjects, Philadelphia, W. B. Saunders Co., 1921. *Moynihan, G. B. A.:* The Pathology of the Living and Other Essays, Philadelphia, W. B. Saunders Co., 1910.

1671 OCTAVIA STREET.

(For discussion, see page 401.)

TRACHELOPLASTY VERSUS TRACHELOPLASTERING*

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WHILE many operations on the cervix are claimed to be modifications of the tracheloplastic operation devised by Sturmdorf, they are in reality entirely different procedures. Judging by the reasons presented for these modifications, it is evident that the fundamental principles upon which they are based are not those which prompted Sturmdorf's technic. It would only be just to the Sturmdorf operation to call these modifications, "tracheloplastering" operations and not the "tracheloplastic" operation.

Despite the fact that there are many of our confreres who agree that surgical treatment is the only means of eradicating chronic endocervicitis, many are using other methods, such as intracervical injections of drugs, with the hope of cicatrizing the deep glands of the cervix, the needle cautery with the same object, and the ordinary cautery which, when applied to the cervical canal, causes a sloughing of the superficial epithelium with occlusion of the ducts of the racemose glands. The reason advanced for these procedures is that the patients are relieved of the discharge without being hospitalized. These advocates fail to realize that the discharge is only one of the symptoms of chronic endocervicitis. The ultimate outcome of such indiscriminate use of a dangerous instrument will only manifest itself later.

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This paper will deal chiefly with the surgical treatment of chronic endocervicitis, contrasting the technic devised by Sturmdorf with the many modifications practiced. This latter phase of the subject is important because the end-results, be they good or bad, are credited or debited to the original Sturmdorf operation. This is unfair, since a good operation which can be correctly performed may be and usually is discredited by modifications.

With our present knowledge of the pathology of chronic endocervicitis as given to us by Sturmdorf together with his description of the muscular mechanism of the cervix, one can readily see the reasons for the several important steps in his operation. He tells us that his aim is to remove the cervical lining which is diseased and to reline the canal with healthy vaginal mucosa which is devoid of any racemose glands. He emphasizes also that the musculature of the cervix should be damaged as little as possible so as not to interfere with the diaphragm-like action of the cervix during labor, for the musculature of the cervix is not arranged to form a sphincter because its fibers, which are continuous with those of the uterine body, do not at any point encircle the cervix, but are disposed in a serried succession of oblique circle segments, which by contracting spirally upward, necessarily shorten every diameter of the uterus, and by their uncoiling in the cervix, widen the os like an iris diaphragm in a microscope.

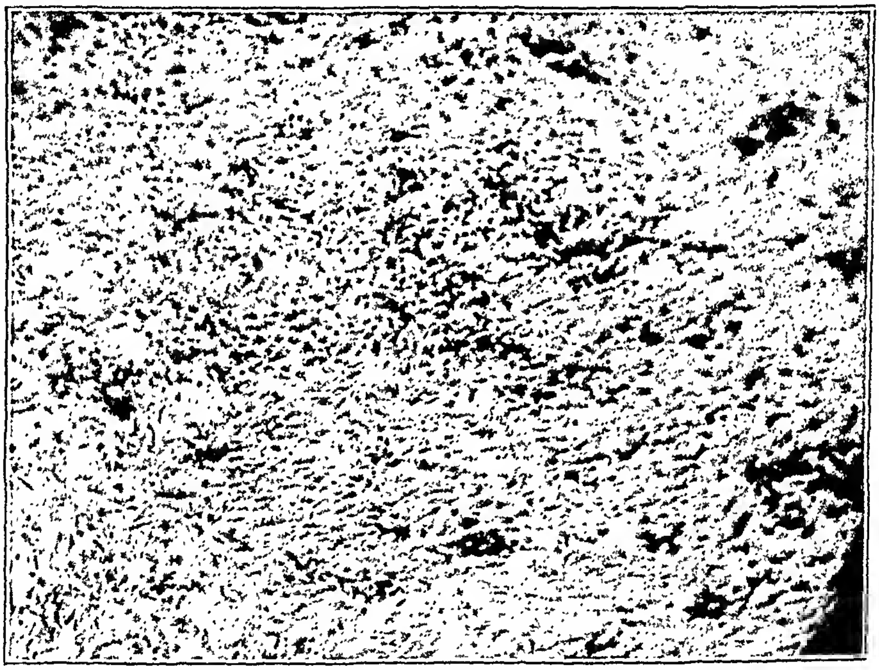

Fig. 1.—Showing dense round cell infiltration in the muscular stroma from a case of chronic endocervicitis one year after cautery treatment.

This problem which Sturmdorf set out to solve, he has successfully accomplished. In a previous communication, I published a series of case records of patients who had been operated upon by Sturmdorf or myself and whose records of later delivery at a hospital were included. Many other records of cases who were delivered at the homes of patients were not included. None of these cases presented any difficulty in labor.

For the exact technic of the Sturmdorf tracheloplastic operation, reference may be made to the author's book on this subject. Many modifications have been proposed. One is based on the fear of too much bleeding, and the danger of damage to the circular artery is sought to be overcome by a preliminary ligation. From the direction emphasized by Sturmdorf, that the scissors must stick close to the mucous membrane that is being denuded and remembering that one is not to go too high up on the lateral aspects of the cervix, it is hardly possible to cut the circular artery.

Another modification is the insertion of two heavy ligatures laterally to act as guy ropes on the cervix instead of the laterally placed tenaculae. This modification adds nothing to the technic but, on the other hand, it impairs circulation.

Another modification deals with the manner of coring out the diseased mucosa. This author advises bilateral splitting of the cervix, then cutting away the mucous membrane of the cervix in two parts. He suggests a submucous half purse string suture beginning at the angle of the wound. When the opposite angle is reached, the needle enters the canal and comes through the flap. The suture is completed by bringing it through the opposite angle. By these modifications, he makes a complex operation, produces more trauma, more scar tissue and violates the underlying principles of the Sturmdorf operation. Cases operated on in this manner must yield poor obstetric end-results.

Some resent the use of silkworm gut and advise the using of chromic catgut. Assuming that the operation is performed strictly in accordance with the technic described for the tracheloplasty, with but this exception, the results in many instances were not good because the catgut had been absorbed too early, resulting in a gaping discharging wound. Why use catgut when silkworm gut has been found to be a better suturing material, since it also helps drainage? Removal of the silkworm gut can be accomplished by a little practice.

In a comparatively recent edition of a popular book on "Diseases of Women," the author mentions the Sturmdorf operation, quotes the principles underlying the technic, and gives several illustrations that are unique and original with the author. Anyone knowing the Sturmdorf technic can at once see that these pictures are not at all descriptive of the tracheloplastic operation. Those surgeons, however, who would allow themselves to be guided by such pictures, must have poor end-results. These end-results are also erroneously credited to the Sturmdorf operation.

There are more modifications and many more will come to our attention until the profession realizes that the tracheloplastic operation as devised by Sturmdorf is excellent in every respect. Unless the surgeon follows the exact technic, he has no right to attribute his failures to the operation as devised by Sturmdorf.

Before discussing the cautery treatment in chronic endocervicitis, let us bear in mind that every curative attempt must have a definite aim and scope. The aim and scope must be based upon recognized pathology and etiology of the disease.

If Sturmdorf has done anything, he has established the pathology of endocervicitis as a clinical entity. Today all pathologists agree with him that the so-called erosion and eversion and ulceration are part and parcel of an endocervicitis which involves the cervical mucosa from the external to the internal os. If we agree upon this pathology, the rational cure of chronic endocervicitis must remove the endocervical mucosa in its entirety and reestablish the cervical canal, maintaining the muscular function of the cervical musculature. This the tracheloplastic operation, unmodified and correctly executed, will accomplish in nearly every case without complications.

Compare this with the cautery treatment. The first rule of cautery treatment is to avoid the cervical canal, so as to prevent stenosis—notwithstanding which, stenosis frequently occurs. The advocates of the cautery claim that the cicatricial contraction being longitudinal obviates stenosis. This is a fallacy. The cauterization is longitudinal, while the tissue destruction is latitudinal with ultimate cicatricial contraction. This applies with greater force to the deep puncture advocated by some.

The so-called cure of the erosion or ulcer is a misinterpretation of end-results. Microscopic sections showed plainly that the apparent healing is a substitution of cicatricial tissue in the place of the transparent endocervical epithelia which originally covered the so-called eroded area; but most important of all, microscopical examination of so-called cures by the cautery revealed plainly in every instance that the pathologic infiltration or ascending lymphangitis from the infected focus within the cervix continues as actively as before. In other words, to treat the area around the external os for so-called erosion is to treat a symptom and not the disease.

As to the leucorrhea, which is only a symptom, the amount of secretion may be diminished by the obliteration of some mucous glands. Every case that has come under close observation shows a marked continuance of the discharge, provided the usual instruction to these patients—to stop douching—is not given. If we agree on the pathology, how then can we agree upon the difference of radical treatment by tracheloplasty and the treatment by the cautery?

Let me quote from an advocate of the cautery who also advises the tracheloplastic operation in cases "where there exist more extensive and deeper infections with hyperplasia and cystic changes that may not be eradicated, with safety, by the cautery." His statistics on the "follow-up results" comparing the two methods are interesting and speak for themselves. In Table II of his series he shows that he treated by the cautery 55 cases where hospitalization and anesthesia were required; 28 were cured, or 51 per cent; 18 were improved, or 32.7 per cent, and 9 unimproved, or 16.3 per cent. By the tracheloplastic operation, 70 cases were treated, of which 49 were cured, or 70 per cent; 16 were improved, or 22.8 per cent, and 5 were unimproved, or 7.2 per cent.

Special attention is called to the fact that by the tracheloplastic operation, no attempt is made to treat leucorrhea, or the erosion or the laceration. The operation is for the cure of endocervicitis, which means that it acts as a prophylactic measure against future pelvic infections, ectopics, sterility and possibly carcinoma.

Is it not worth while to learn to do the radical operation properly which confines the patient to bed from twenty-four to seventy-two hours than to revert back to the discarded empiricism of fifty years ago?

REFERENCES

(1) *Thomas:* Diseases of Women, pp. 17-40. (2) *Sims:* Tr. Med. Soc. N. Y.; Albany, 1861, pp. 367-371. (3) *Emmet:* Am. Jour. Obst., 1868-69, i, 339-362. 1874-75, vii, 442-456. (4) *Leonard, V. H.:* Surg. Gynec. and Obst., Jan., 1914, xviii, 35; 1913, xvi, 390. (5) *Sturmdorf:* Jour. Am. Med. Assn., 1917, pp. 42-53; Surg. Gynec. and Obst., January, 1916, pp. 93-104; Gynoplastic Technology, F. A. Davis, 1919. (6) *Magid:* N. Y. Med. Jour., October 5, 1921. (7) *Crossen:* Diseases of Women, 1922, pp. 459-460. (8) *Rottenberg and Schwartz:* Surg., Gynec. and Obst., Nov., 1924. (9) *Matthews:* Jour. Am. Med. Assn., Nov. 27, 1926, lxxxvii, 1802-1808.

UTERUS DUPLEX UNICOLLIS*

WITH COMMENTS ON MALFORMATIONS OF THE UTERUS

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THE formation of a normal uterus is contingent upon the fusion of the lower half of the apposed müllerian ducts with disappearance of the intervening duct walls, so that a single chamber (the uterine cavity) is created. The point at which the wolffian mesentery, containing the müllerian ducts and remnants of the wolffian body and duct, and the genital fold cross each other is the area in which the differentiation of the original müllerian ducts into the fallopian and uterine segments occurs. Muscular fibers are developed in the sub-

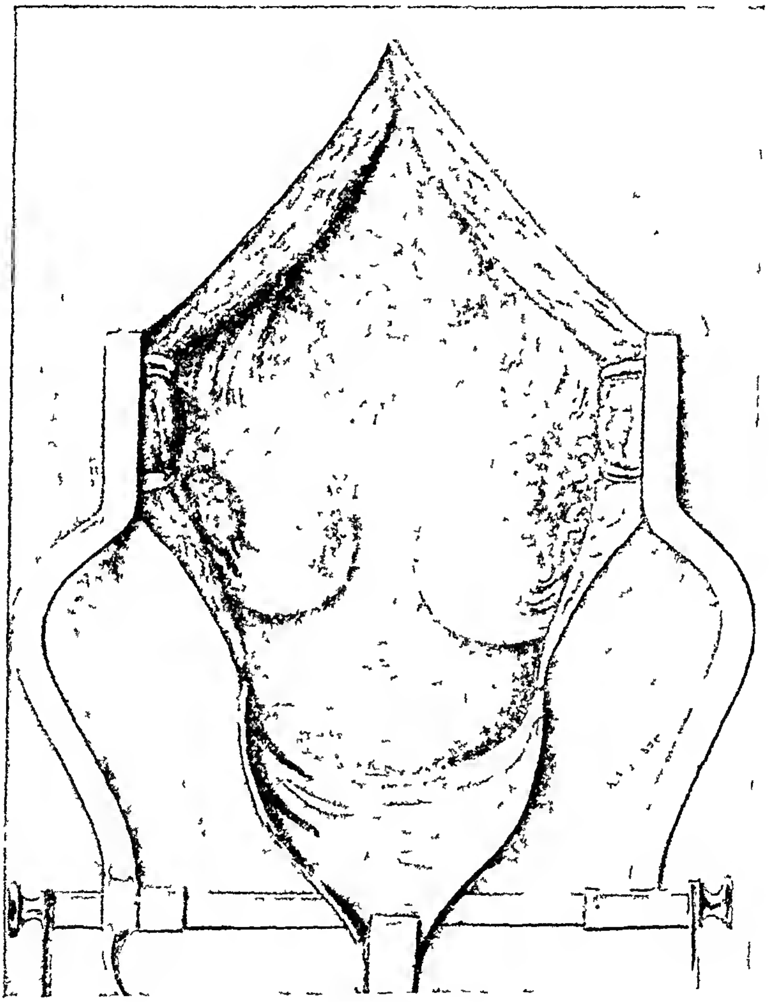

Fig 1

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*Read before the Section of Obstetrics and Gynecology, New York Academy of Medicine, February 22, 1927 peritoneal tissues of the wolffian and genital mesenteries of the embryo, which in some way decussate and interlock, thus leading to a coalescence of the müllerian ducts. If the genital fold proves stronger than these interlocking muscle fibers, union of the müllerian ducts may be partly or entirely prevented, so that an intermediate arrangement becomes permanent. In most instances of malformation of the uterus there is a parallel development of the two sides, although in some cases the growth of one side may be arrested, the other pursuing its normal course.

There are six well-defined variations in malformation of the uterus, and every experienced gynecologist has probably encountered one or more examples of these developmental defects in his practice. Their recognition is of importance chiefly because of their influence on the childbearing function, and the diagnostic difficulties they present when complicated by tumor formation, to which they seem to be prone. Although the legendary textbook teachings inform us that patients with uterine anomalies are usually sterile, a survey of current periodical literature, as well as my own experience, seems to prove quite the contrary. I have had 13 patients in twenty-one years with malformation of the female pelvic organs, 11 of whom were married; five of the 11 married women had never been pregnant, but the other six produced collectively 16 children and 11 miscarriages. Only three patients

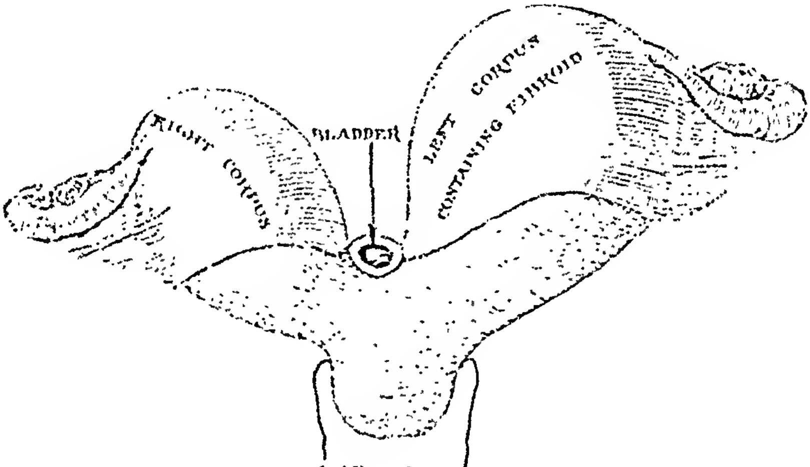

Fig. 2.

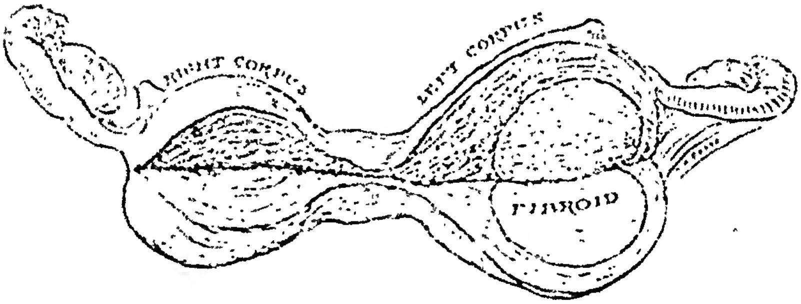

Fig. 3.

had anomalies involving the vagina, and it is interesting to note that all three were sterile. The fact that eight of the 11 miscarriages were admittedly induced abortions is also worth mentioning.

I present the history of a patient from whom a specimen was removed that does not conform exactly to the specifications of any one of the usual types of uterine malformation.

Mrs. T. H., aged 44, was admitted to my service at the Post-Graduate Hospital on November 29, 1926. Menstruation began at 13, and was normal in time, duration, and amount from the date of onset. She had had 5 full-term children, delivered without difficulty, and 4 abortions, 3 of which had been induced. There was no reappearance of menstruation during pregnancy or lactation. For one year previous to admission the patient suffered from pain in the left lower abdominal quadrant, gradually increasing menorrhagia, and shortened intermenstrual intervals.

Bimanual examination disclosed a uterine corpus, normal in size, symmetry, consistency, and mobility, deviated slightly to the right. On the left side, I found an enlarged, hardened, pyriform, and symmetric structure, arising from a broad attachment just above the level of the internal os, which I believed to be a pedunculated fibromyoma. The adnexa were not palpable.

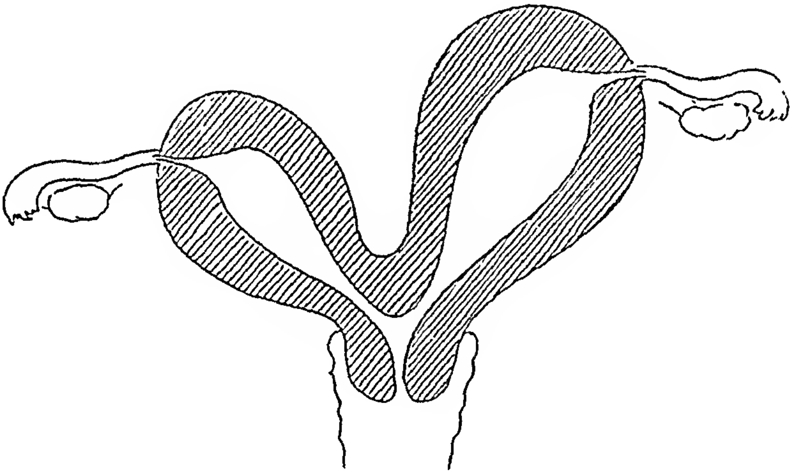

Fig. 4.

On opening the abdomen in the midline and clearing the pelvis of intestines, the posterosuperior aspect of two perfectly formed uterine bodies presented (Fig 1). The one on the left was larger than the other, but palpation determined that this was due to the presence of an intramural fibroid. The cleft between the uteri extended downward to the level of the internal os, which was located at a point just above the cervicovaginal junction. The visceral peritoneum covering the bladder and uteri was smoothly merged with that of the culdesac and rectum throughout the intrauterine cleft. The bladder was draped over the anterior aspect of each corpus, but its upper limit was found tucked into the sulcus between the bodies (Fig. 2). A normal tube and ovary were seen on each side. Preoperative examination having determined that the portio was smooth and healthy, a supravaginal hysterectomy was done, after incising the peritoneum on the posterior margin of the sulcus and freeing the upper limit of the bladder.

On opening the specimen, it was evident that each uterine corpus contained a normal cavity, lined with a normal endometrium, which communicated with a single cervical canal. The left uterus contained an encapsulated, fasciculated fibroid tumor (Fig. 3). Histologic examination showed that the endometrium was fully developed in each corpus. The specimen cannot be properly classified as either a uterus didelphys or a uterus bicornis unicollis. Both corpora are fully developed and differ in size only because of the presence of the fibroid tumor. It is not a uterus didelphys because of the single cervix and cervical canal; and the very deep cleft extending all the way down to the level of the internal os, with the so-called rectovesical ligament lying in the sulcus, removes it from the group of bicornate uteri. It can best be described as a uterus duplex unicollis (Fig. 4).

The patient's postoperative convalescence was uneventful, and subsequent cystoscopic examination disclosed no abnormality in the urinary apparatus.

580 PARK AVENUE.

REPORT OF A FETAL SEXUAL ANOMALY

BY NATHAN L. THOMPSON, M.D., F.A.C.S., AND
J. WARREN BELL, M.D., PH.D., EVERETT, WASH.

MRS. C., presented herself May 18, 1926, in the eighth month of pregnancy, with slight swelling of the limbs which increased in the next three weeks to the point where treatment was indicated.

Despite treatment she appeared one week later, June 15, 1926, with some edema of the abdominal wall and a trace of albumin, but with no increase in blood pressure, and a practically normal urinary output.

One week later she showed albumin ++, blood pressure 150/80 and many hyalin and granular casts. She was now approaching the ninth month of pregnancy. During this week her abdomen became much larger, indicating a polyhydramnios; she felt and looked sick.

Patient was placed in the hospital and labor started with castor oil and quinine. Labor did not progress very well and a bag was introduced. Labor then proceeded rapidly. When the bag, which was of large size, was expelled she was in active labor with practically complete dilatation. Large quantities of water had come away, on rupture of the sac, at introduction of the bag. An unsuccessful attempt was made to turn the posterior occiput into R.O.A. An easy forceps delivery was made of a dead eight and one-half months' deformed fetus.

Previous to this, after the water had come away, a diagnosis of a probable twin pregnancy had been made, though only one heart tone could be obtained, the reason for which was now obvious.

There was a large mass of cord all matted together. By means of a hemostat 9 loops were disengaged and the twin was extracted by easy breech. This baby was a female weighing 5 lbs., 12 oz., and normal in every way.

A description of the anomalous and deformed fetus and placenta follows:

The placenta was 20 cm. in diameter and about 3 cm. thick. Two umbilical cords were attached to the fetal side, near its center, at points about 5 cm. apart. There were no divisions in the umbilical sac and no visible division in the placenta. Membranes, amnion as well as chorion, were complete with the exception of one opening at a point opposite from the location of the placenta, through which the children had been delivered. The maternal side of the placenta appeared normal. We concluded this was the placenta of unioval twins, with one amniotic cavity.

The fetus weighed approximately 2250 gm. (5 pounds) and its length, from head to rump, was 28 cm. Both feet were clubbed (Bilateral talipes equino-varus) and the hands showed a corresponding deformity. The knee joints were very large.

but the movement was limited. There was diminished movement in the hips as well. The legs remained flexed at the hips and turned out, with flexion of the knees to 90.° Effort to straighten the limbs resulted in the fracture of the femur in the left leg. The development of the head appeared normal except for a high, narrow, palatal arch. The thorax appeared normal. Breasts showed no unusual development. The abdomen showed the presence of a median tumor, and by careful palpation its approximate limits were marked out, as well as the limits of a definite hard mass in the left upper quadrant. (Fig. 1.)

No rectal opening or dimple could be found. The genitourinary apparatus was not typical of either male or female development. The external organ consisted entirely of a conical shaped mass two cm. in height, and 1 cm. in diameter, remaining in an erect position. Its position was about that of a clitoris. There was a small opening on its ventral side near the tip, from which a drop of milky material could be forced out by pressure on the abdomen. No scrotum, labia, or vagina could be made out.

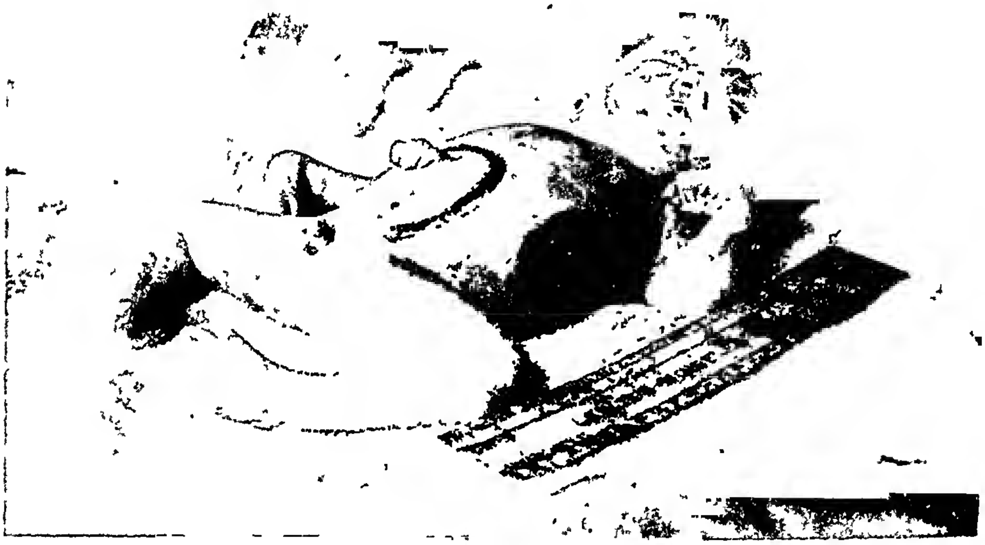

Fig. 1.—Fetus showing outline of tumor.

In order to learn more about the skeletal development a radiogram was made, with the exposure cut down. No bone was found in the tumor. There was a definite shadow, in the upper left quadrant of the abdomen, corresponding to the outline of the tumor.

In the lower abdomen was a large irregular cystic mass which measured 5x8 cm. It was composed of a median cavity, and on each side was another tense cyst somewhat smaller, terminating in a tube less than 1 cm. in diameter.

Between the median cyst and the left cyst was the lowest portion of the bowel, representing the descending colon, or sigmoid, filled with dark meconium. It terminated in a solid cord at a point above and behind the median cyst, about 4.5 cm., away from the normal location of the anus.

The excretory organ was opened and within was found a dilated cavity, which led through a thin tube into the median cyst. Before opening the tube a small sound was passed clear into the median cyst.

The appendix could be seen, at a point a little higher than normal, on the right side.

From the central cystic cavity, two tubes were traced upward, one on either side of the vertebral column, to a point a few centimeters below the diaphragm. Here each one ended in a dilated structure resembling the pelvis of a kidney, around which was a small clump of yellow-gray tissue (2x1 . 5x5 cm.).

Upon opening the left cyst 10 or more c.c. of milky fluid ran out. From the median cyst about 50 c.c. of the same kind of material, and from the right cyst about 20 c.c. This milky fluid was allowed to stand for a few days and a sediment (80 per cent by vol.) collected, leaving opalescent fluid above. Upon shaking and centrifuging the sediment was reduced to 20 per cent by volume. It consisted of large pavement epithelial cells with large amount of cytoplasm, and a dark staining nucleus, of moderate size, placed near the center. The opalescent fluid was acid and contained no urea. The specific gravity was 1050.

There were two ounces of orange-colored fluid from the pleural cavities. This fluid was acid in reaction, and contained 80 per cent, by volume, of albumin.

The stomach was in normal position. Pericardium and heart were normal. Lungs were collapsed, but showed normal divisions. The thymus was normal in appearance. Thyroid appeared normal.

Unfortunately the tissues were not secured for microscopic examination until after the second day, at which time some decomposition had taken place. There remained, however, sufficient unchanged tissue to be of considerable assistance in determining the time at which the anomaly occurred.

CONCLUSION

We are of the opinion that this combination of anomalies resulted from an arrest in development shortly after the period when the cloaca is replaced by separate structures for the discharge of reproductive, urinary, and digestive excretions. We consider the sex female because no male sex glands were found, because a female gland was found, and because the specimen was one of unioval twins, the other twin being of the female sex, and because of the presence of very definite structures representing fallopian tubes.

The relation of the rudimentary ureters and kidneys warrant, we believe, the opinion that the central sac was destined to become a bladder. The fact that all three sacs contained similar fluid, rich in epithelial cells, confirms the belief that they arose from a common anlage.

SARCOMA OF THE RECTOVAGINAL SEPTUM*

By Onslow A. Gordon, Jr., M.D., Brooklyn, N. Y.

(Clinical Professor of Gynecology, Bellevue Medical College; Obstetrician, Peck Memorial Hospital)

THIS case is presented for two reasons: First, because of the infrequent occurrence of vaginal sarcoma exclusive of sarcoma botryoid. Second, because of the apparent confusion of opinion among pathologists as to the histologic type of tissue in this case.

Mrs. D., 51 years of age, reported for examination March 12, 1926, complaining of irregular vaginal bleeding and a sense of pressure in the lower abdomen.

Her family history was irrelevant, there being no history of malignancy or constitutional disease. Her previous medical history was irrelevant. Her menstrual history showed that she passed an apparently normal menopause six years ago.

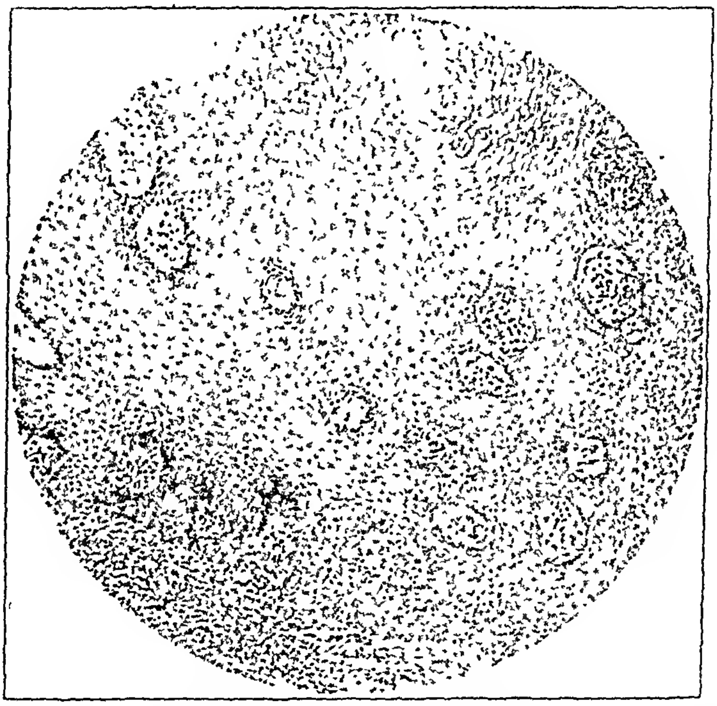

Fig. 1.—Mucosa and portion of submucosa, adjacent to neoplasm. The submucosa is densely invaded with inflammatory cells. No evidence of tumor in this area.

Her previous surgical history revealed a laparotomy in October, 1924, at the Peck Memorial Hospital at which time she was thought to have a large ovarian cyst. A retroperitoneal teratoma weighing 11 kg. (26 pounds) was removed together with the right kidney. Histologic examination of this tumor showed in places a disorderly arrangement of epithelial cells suggesting a potential malignancy. There was no evidence of sarcoma. At the time of operation the uterus, both tubes and ovaries were macroscopically normal.

Present illness.—The patient had noted moderate but gradually increasing metrorrhagia for four months, since November, 1925. She also noted for a short time past a sense of pressure in the rectum especially upon defecation. She was otherwise in excellent condition and gaining in weight.

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*Read at a meeting of the New York Obstetrical Society, January 11, 1927.

General physical examination was negative. She was apparently in good health, her weight being 182 pounds. Abdominal examination showed a fat and pendulous abdominal wall. A postoperative scar measuring 25 cm., largely above the umbilicus, was well healed. No palpable masses, no tenderness. Inspection of the vaginal introitus showed the mucous membrane of the anterior wall near the urethra to be friable and bleed easily over an area of about 1 cm. in diameter. There was a tumor mass apparently in the rectovaginal septum about 2 cm. above the sphincter, the mass being about 4 cm. in diameter. At several points it seemed to have eroded the mucous membrane of the posterior vaginal wall in a polypoid type of freely bleeding masses. There was no involvement of the cervix nor vaginal vault. No adnexal or parametrial pathology was palpable. The uterus was apparently small and senile. Rectal examination showed no ulceration of the rectal mucosa. The nodular mass under the posterior vaginal wall was plainly palpable anteriorly. A provisional diagnosis of sarcoma or malignant adenomyoma of the rectovaginal septum was made and biopsy advised.

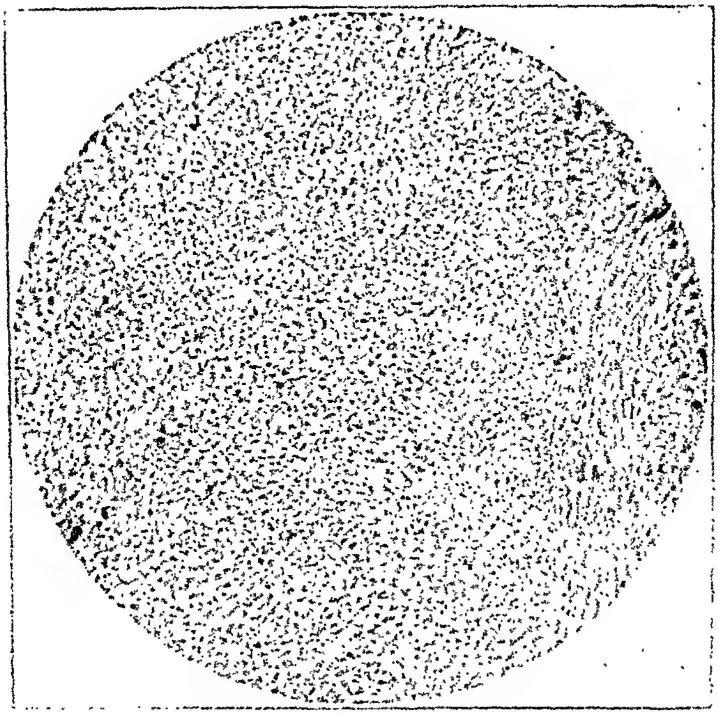

Fig. 2.—Area from neoplasm, frankly a malignant type of sarcoma, well vascularized. The neoplastic cells are of small round and short spindle type.

The patient was operated upon March 13, 1926. The vaginal mucous membrane covering the tissue of the tumor under the posterior vaginal wall was reflected exposing a soft freely bleeding tumor mass about 4 cm. in diameter; this mass was removed by cautery. The small hemorrhagic area on the anterior wall was also cauterized. A specimen was sent to the laboratory.

Doctor Hala, pathologist to the Peck Memorial Hospital reported that the section of a portion of vaginal mucosa and underlying tissue showed the mucosa partly ulcerated and in other places thinned out by the presence of subepidermoid blood cysts. The underlying tissue consisted entirely of neoplasm and granulation tissue. The neoplasm was distinctly histioid, i.e., without definite or organoid structure. It consisted of densely packed, round, spindle and oat-shaped cells supported by a diffuse delicate reticulum and wide, more densely fibrotic, trabeculae. The tumor was definitely sarcomatous and polymorphocellular in type.

As the neoplasm was of somewhat unusual interest slides were shown to two other pathologists. One was of the opinion that the tissue was not malignant but was excessive granulation tissue. The third opinion I will quote verbatum. "In the section of tissue of the vaginal wall, in the case of Mrs. D., I am unable to convince myself that there is anything more than granulation tissue. The tissue is extremely cellular at certain points, suggesting, as you say, a tumor process, but most of the material is composed of very numerous cellular blood vessels. I think it is safest to assume this process to be exuberant granulation tissue. This opinion may be altered by the subsequent course of the disease."

Twelve days after operation, March 25, vaginal examination showed several hard nodular masses along the posterior vaginal wall well above the location of the primary mass.

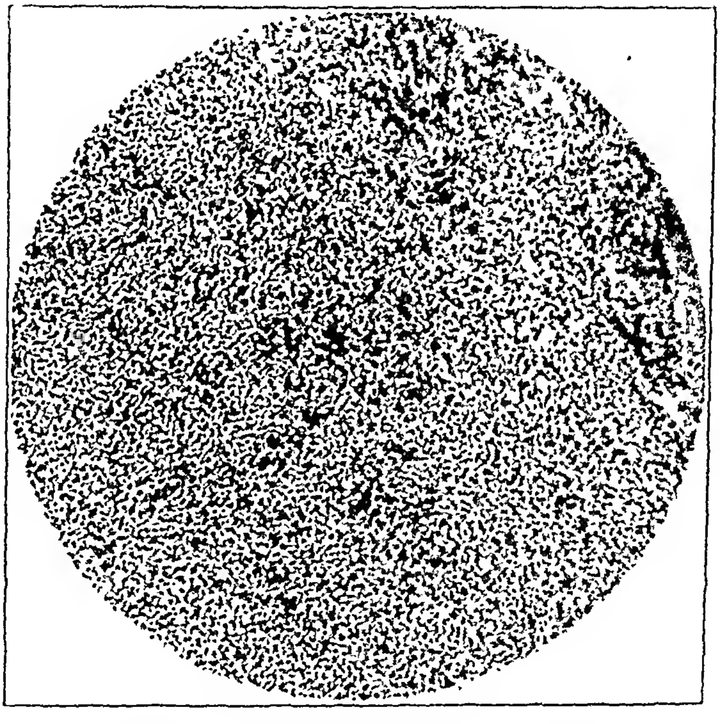

Fig. 3.—Area from neoplasm. Note the extreme vascularity and dense cellular structure.

Doctor William P. Healy was asked to see the patient in consultation on March 30. It was his opinion that the patient was suffering from a very malignant type of sarcoma. He suggested a radiographic examination of the chest and lumbar spine. The spinal radiograph was negative. From the chest examination Doctor Eastmond reported a mediastinal mass behind and external to the right side of the heart, probably metastatic.

On April 6, the patient was transferred to Dr. Healy's care at The Memorial Hospital, New York City, that she might receive intensive treatment by radium and x-ray. She was discharged from The Memorial Hospital April 16, following radiation and died at her home two weeks later from sepsis and cachexia.

As to the infrequency of occurrence of vaginal sarcoma, Robert Frank states that McFarland, in 1911, collected sixty-eight cases. He also says that these growths appear as nodular, sessile, polypoid or more rarely diffuse stenosing growths. The anterior and posterior vaginal walls are most frequently affected. To quote further from Frank, "At first the vaginal epithelium covers these growths; later necrosis occurs and penetration of the neighborhood takes place. Huge necrotic hemorrhagic cystically degenerating masses may result." That is what occurred in this case.

Frank Lynch states that he is convinced that surgical treatment of these cases is of no avail. He further states that the prognosis is always death, that radiation is only palliative and that there is no record of a case surviving after five years following any method of treatment.

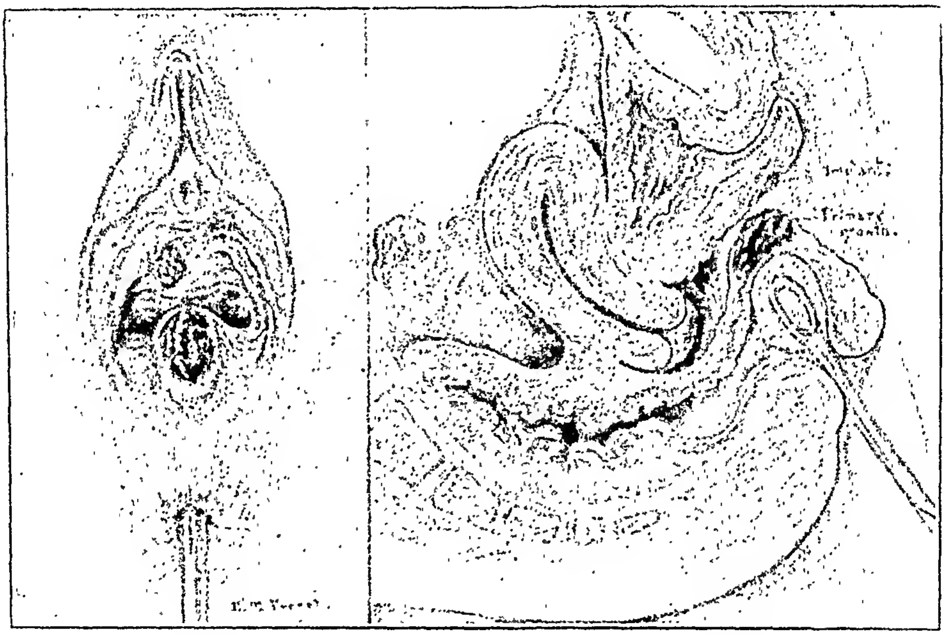

Fig. 4.—Sarcoma of rectovaginal wall, with implant on anterior vaginal wall.

In reference to the apparent confusion in interpretation of the histologic findings I would say that upon careful consideration this is not surprising. Lynch states that the degree of malignancy or benignancy of these growths cannot be judged from their histology alone and that an absolute histologic classification is impossible.

71 Halsey Street.

FIBROMYOMATA OF THE CERVIX—CASE REPORT

By Philip J. Reel, M.D., F.A.C.S., Columbus, Ohio

(From The Department of Gynecology and Pathology, The College of Medicine, The Ohio State University)

WHILE fibroids of the cervix are more serious than those of the uterine body, fortunately they are much more rarely found. Their relation to and importance in obstetrics cannot but be appreciated since it is rarely if ever possible to obtain dilatation of the canal equal to that required for delivery.

Because of the unusual size of the tumor and a rather interesting clinical history the following case is reported: The patient was a young white girl, aged 25 years, whose chief complaint, when she first came for examination, was enlargement of the abdomen associated with uterine bleeding. During the preceding seven or eight months she had been conscious of a slow, progressive enlargement of the abdomen so that at the time of examination her appearance was not unlike that of a pregnancy at term. Until two weeks prior to her admission into the hospital she had suffered no inconvenience other than slight constipation and occasional distress from hemmorhoids. At this time, while attempting to carry a heavy suitcase she suddenly developed a severe hemorrhage which necessitated immediate medical attention. Examination at this time revealed the presence and character of the tumor; the patient, however, refused operation until she could be removed to her home city.

The menstrual history was entirely negative except for the hemorrhage mentioned above. There had been no pregnancies. Her past and family history were likewise negative except that the mother had been operated some years previously for a uterine fibroid.

Upon physical examination the abdomen presented a symmetric enlargement about the size and general contour of a full term pregnancy. The upper margin of the tumor was rounded and dome-like, extending to within a finger's breadth of the ensiform. Palpation revealed the mass to be solid and smooth in outline except for a small nodular protuberance the size of an egg located on the upper margin and to the left of the midline. The anterior abdominal wall, although somewhat tense, was freely moveable over the mass.

Pelvic examination showed that the vaginal orifice was very small and the vagina admitted the introduction of but one finger for a distance of 2 cm. A complete effacement of the cervix was found. A large, hard tumor was impacted in the vagina and apparently filled the entire bony pelvis extending upwards into the abdomen to within a very short distance of the ensiform. The mass was so solidly impacted within the bony pelvis that it was impossible to move any portion of it. Rectal examination showed the growth occupying all of the hollow of the sacrum.

At operation the uterus was found extending well above the umbilicus. Enormously dilated veins were present in both broad ligaments. The body and fundus of the uterus were located on the upper margin of the growth a small distance to the left of the midline. Here also were encountered the tubes and ovaries practically normal in size and position in so far as their relation to the fundus was concerned. The operative removal was unusually difficult because of dense adhesions between the fibroid and the rectum and the impaction within the bony pelvis.

The pathologic report showed the tumor to be a true fibroid of the posterior portion of the cervix weighing 7 kg. The external os was found to be flush with the rounded lower surface of the mass while the cervical canal extending from the external os to the base of the uterine body measures 20 cm., the uterine canal being but 1.5 cm. in length. Gross section revealed the typical structure of fibromyomata while the microscopic examination showed a rather marked cellularity.

Fibromyomata of the cervix while not exceedingly rare are sufficiently infrequent to comprise an interesting group of tumors. A careful routine examination of all removed uteri would tend to place their percentage of occurrence at about 6 per cent. They may arise in any portion of the cervix although the posterior lip would seem to be the most frequent site of origin. The genitourinary tract may present important complications when these tumors are of considerable size, especially if they extend anteriorly or laterally within the pelvis. The removal of the tumor which has impaired ureteral drainage may result in a sudden release of back pressure within the kidney and the production of an acute postoperative suppression, the seriousness of which may deter the convalescence of the patient.

MEDICAL ARTS BUILDING.

Rudaux and Durante: A Gravid Uterus Without Apparent Adnexa. Bulletin de la Soc. d' Obstétrique et de Gynécologie, 1925, xiv, 630.

A gravida ii, aged 32, was admitted to the hospital because of eclampsia and died the same day. She had previously had a miscarriage at six months. Autopsy showed an apparently normal uterus but there seemed to be a complete absence of the adnexa and broad ligaments. An abdominal scar was present. Inquiry revealed that an operation had been performed four years previously for an ectopic pregnancy on the right side. The surgeon who operated said that he had removed the right tube and perhaps part of the right ovary but he did not touch the adnexa on the left side. A second operation was performed two years later for a left-sided inguinal hernia.

Only on histologic examination was an ovary found. This was atrophic and contained a corpus luteum. This ovary and the accompanying atrophied tube were buried in the uterine wall on the left side of the uterus. No follicles were seen in the ovary. The authors believe that the condition of the tube and ovary found was not accidental but a congenital anomaly. It is possible that the ectopic pregnancy for which the patient was operated upon, may have occurred in a similarly anomalous tube. The above case indicates that in cases where both ovaries seem to be missing on macroscopic examination no definite conclusion should be drawn until after histologic investigation. J. P. GREENHILL.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D.

A MATERNITY HUT IN THE NEAR EAST

(From the Society for Near East Relief)

OUTSIDE the city of Beirut there are camps of Armenians, refugees from Asia Minor, who have been given hospitality in Syria for several years. Their dwellings are often ingenious, as witness several sheathed with flattened gasoline tins, but are very crude. A club of American and British women cooperates with the city in welfare work; Near East Relief maintains a clinic for the refugees and a Day Nursery where the mothers leave their small children while they go out to earn for their little brood.

Armenian refugee mothers with their babies born at the Near East Relief Maternity House, Beirut, Syria. Dr. Wilson Dodd, Medical Director, stands at the left center beside Miss Agnes Evon, Director of Nursing Service. The other doctors and nurses are native Armenians.

Naturally life is a bitter struggle for these unfortunates, bereft of homes and property, doing their best in a strange land to contend with problems of housing and unemployment. One of the most serious of their difficulties has been the absence of any opportunity for maternity care. In the hour of their darkest need these poor women had only their neighbors and friends to help them.

The situation was a source of anxiety to Agnes Evon, the American head of the Near East Relief Nursing Service. With Dr. Wilson Dodd, Princeton, 1916, in charge of the Medical Service, she believed that the doctors and nurses, who were all eager to help, might shoulder the extra burden of the maternity work if it could be concentrated. Concentration meant the building of a hospital adjoining the Near East Relief Clinic and Day Nursery, but there was no money with which to do it.

Yet it was done. The American and British resident women raised the needed funds, and a hut twenty-two feet by forty-five feet was erected. It is of the simplest type, yet its equipment is sufficient, and the babies, dozing and gurgling in their market baskets, are as content as if they were cradled in expensive bassinettes. It has but fourteen beds, but they are enough for each has three patients a month. Its decorations are confined to the beauty of cleanliness and to the freshness of blue and white curtains at the windows.

Already this hospital has proved a superlative blessing. No one who can pay for medical or nursing service is admitted. It reaches the poorest of the poor with its timely and comforting aid.

Support comes from a local charitable society, from the American and British women's club, and from Near East Relief (which contributes the medical and nursing service). It is to continue this and similar work, as well as that for orphan children, that the National Golden Rule Committee asks for donations on Golden Rule Sunday, the first Sunday in December.

MEETING OF THE JOINT COMMITTEE ON MATERNAL WELFARE

A MEETING of the Joint Committee on Maternal Welfare was held in Washington, D. C., on May 18, 1927, Drs. Lynch, Speidel and Kosmak being in attendance. The report of the Chairman of the Committee, Dr. Fred L. Adair, whose absence was due to illness, was considered, and the following recommendations were acted upon: The advisability of holding two meetings annually was favored. Until a more definite financial plan could be worked out it was resolved to continue the requests for the usual appropriations from the participating societies.

The appointment of the chairmen of the subcommittees for each state was to be continued as offering the most favorable method of extending the work of the central committee.

A report on intrapartum care, prepared by Dr. W. C. Danforth, was to be referred to the constituent members of the Committee for study and suggestions.

A resolution was introduced at the Section meeting of the American Medical Association providing for an investigation of the maternal mortality from puerperal sepsis in the United States. Further action on this resolution will be referred to in a later report.

It is a pleasure to record that the Section on Obstetrics and Gynecology of the American Medical Association acted favorably on the suggestion to appoint three of its members to the central committee on Maternal Welfare. The latter is now constituted as follows:

American Medical Association, Section Obstetrics, Gynecology and Abdominal Surgery, Dr. Rudolph W. Holmes, Dr. Robert D. Mussey, and Dr. Fred L. Adair.

American Gynecological Society, Dr. Geo. W. Kosmak, Dr. Frank W. Lynch, and Dr. W. C. Danforth.

American Association Obstetricians, Gynecologists and Abdominal Surgeons, Dr. Edgar A. Vander Veer, Dr. Geo. Van Amber Brown, and Dr. Geo. C. Mosher.

American Child Health Association, Dr. Robert L. DeNormandie, Dr. Ralph W. Lobenstine, and Dr. Fred L. Adair, with Dr. Fred L. Adair, of Minneapolis, Minn., as Chairman of the Joint Committee.

Society Transactions

NEW YORK OBSTETRICAL SOCIETY

MEETING OF JANUARY 11, 1927

DR. W. P. CONWAY reported a case of **Ruptured Ectopic Gestation and Incomplete Abortion.**

This patient, E. M., Italian, thirty-three years old, married, para-seven, was admitted to the Gynecological Ward in the Atlantic City Hospital, on October 13, 1926, with a diagnosis of incomplete abortion, six to eight weeks, and a tender mass in the lower right quadrant of the abdomen. Her last menstruation was August 2 to 8, quite normal, and with no more pain than usual. The first week in September she noticed some spotting for two days, but no regular menstruation. From that time on she had a feeling of soreness and pain in the lower right side daily, and for two weeks before admission to the hospital she was in bed on account of this pain. Her physician at that time made a diagnosis of pelvic inflammation with right-sided salpingitis and a pregnancy of six weeks. The treatment given was, rest in bed, ice bags to abdomen, low enemas, and opiates in small doses for the relief of pain.

Three days before admission to the hospital, she had an attack of sudden severe pain, in the lower part of the abdomen. The next day she aborted the fetus only. Since she lived about ten miles in the country her family physician packed her vagina to control uterine hemorrhage, before sending her to the hospital.

On admission the findings were those of a six to eight weeks' incomplete abortion, with a portion of the placenta protruding from the cervix. She was acutely tender on the right side of the uterus and a fluctuating mass could be felt in the culdesac. The temperature was 99.4,° pulse 120, respiration 28. A diagnosis of ruptured ectopic gestation, right side was made, and she was ordered for operation promptly as her condition was poor, and she was given 250 c.c. of glucose solution intravenously. The uterus was irrigated with a large dull spoon curette. Several pieces of placenta were removed and the cavity packed with plain gauze. On opening the adbomen, considerable fresh blood and many black clots were found in the culdesac. The middle third of the right tube was ruptured and there was a hematoma of the right ovary. The fetus, about 1½ inches long, was found and there were many fragments of decidous tissue. The right tube and ovary and appendix were removed, and the abdominal wound closed with layer sutures.

The patient made an uneventful recovery, and left the hospital on the sixteenth day after admission, in very good condition.

DISCUSSION

DR. WILLIAM P. HEALY said there were two points worthy of comment from the operative point of view. He did not advise removal of the appendix in the presence of so much free blood in the peritoneal cavity. Also, it is desirable to leave the ovary on the affected side, if reasonably normal, rather than to remove it with the diseased tube. In this particular instance the ovary seemed not to be normal, therefore it was undoubtedly good judgment to remove it. It was undesirable to curette the uterus before opening the abdomen to remove a supposed ectopic gestation because of the possibility of an error in diagnosis. The lesion may not be an ectopic gestation, but may be a normal intrauterine pregnancy complicated by some other pelvic lesion. Or the condition may be a combination of normal intrauterine pregnancy with ectopic gestation, and it would be unfortunate to terminate a normal intrauterine gestation by curettage.

DR. H. D. FURNISS said that combined uterine and extrauterine pregnancy was rare. Novak (1925) was able to collect from the literature, from 1913 to date, 32 cases, two of them his own. These added to the 244 cases collected by Lengebauer, from 1908 to 1912, gave a total of 276. Dr. John N. Furniss had a case of ruptured ectopic, successfully operated upon, and delivered seven months later of full-term twins.

Recently Dr. Furniss had a patient who was curetted to interrupt what was thought to be a uterine pregnancy. Two weeks later she had a profuse internal hemorrhage as a result of a ruptured ectopic, and was operated upon eight hours later. She had all the appearances of a postoperative hemorrhage, and after blood transfusion he reopened her to find a quart of free blood, the hemorrhage being due to loosening of a ligature at the uterine end of the removed tube. She made an uneventful recovery. He doubted a uterine pregnancy.

DR. CONWAY said in reply to Dr. Healy that on arrival of the patient at the hospital the fetus was out. He emptied the uterus of the placenta and then did the laparotomy for the ruptured tubal pregnancy.

DR. O. A. GORDON, JR., reported a case of **Sarcoma of the Rectovaginal Septum.** (See page 382.)

DR. R. N. PIERSON presented (by invitation) a paper entitled **Fibromyomata and Pregnancy.** (For original article see page 333.)

DISCUSSION

DR. I. C. RUBIN said with reference to the incidence of myomata in sterility, that if some statistic study, comparative in character, should be made, and based on such a large study as Dr. Pierson has presented, it would help us to formulate definite ideas as to the best way to treat this complication.

This might be made to include: (1) cases of sterility associated with fibroids, no operation having been performed; (2) cases of sterility, or pregnancy complicated by fibroids which have been removed by myomectomy; (3) cases of myomectomy done during pregnancy where, (a) either abortion took place or, (b) the pregnancy went on to term.

The reason for such a statistic study is what Dr. Healy has emphasized, and that is that sterility is very common in women who have fibromyomata. Pregnancy may take place in these cases not only during the early reproductive life, but rather late, and at the premenopause in some instances. The first pregnancy very commonly terminates in abortion; the second probably too. The question arises whether we shall in a second pregnancy in a woman who has had a previous abortion, probably due to the fibroid condition of the uterus, do everything in our power to carry her to term, even to the extent of keeping her in bed for three or four months, and then meeting the situation as it might arise during labor, by trial, etc.; or whether we shall let her have her abortion the second time, and then subsequently do a myomectomy in the nonpregnant condition.

It has been Dr. Rubin's practice in the effort to help these women, to give them every chance and not risk doing myomectomy when there is slight bleeding because of the possibility to terminating that very early pregnancy which might have gone on to term and which might have given her the only chance of becoming a mother.

DR. JOHN O. POLAK called attention to the two or three instances of meddling with labor in the presence of fibroids by the introduction of a bag. There is no more pernicious practice than the introduction of a bag for dilatation of the cervix in fibroid uteri. We usually have an inertia in these cases due to a bad uterine wall with potential sepsis owing to defective drainage. We can prevent abortion in a large number of these women if we teach them how to behave during pregnancy. The tendency to abortion is much more frequent when fibroids complicate pregnancy than in normal pregnancy. These patients should be taught to rest at the time of the expected period and to abstain from sexual relations until the pregnancy has passed the fourth month, and to take the knee chest position night and morning for a period of ten minutes. By assuming this posture incarceration of the heavy uterus is prevented and pelvic engorgement relieved.

Dr. Polak believed a large number of these pregnant women with fibroids will take care of themselves during labor, and he lets these women go to term, and gives them a test of labor. If they do not deliver spontaneously (and they usually deliver promptly if they are going to deliver spontaneously) he does a cesarean which is followed by hysterectomy. These uteri contract and retract poorly and uterine drainage is interfered with which results in morbidity or mortality. Six or eight years ago he had several cases in succession in which conservatism was attempted. They all drained badly and two of them died from infection.

DR. A. B. DAVIS called attention to pedunculated myofibroma of the uterus, with or without torsion of the pedicle, as a complication of pregnancy. In 1925, a primiparous patient came under his care when she was three months pregnant. Nausea and vomiting were troublesome symptoms which continued to some extent throughout the pregnancy. There was a report that when two months pregnant she had a short sharp attack of bleeding which ceased.

Upon first examination normal uterine pregnancy was found, and also a rather freely movable mass to the left side of the uterus. A diagnosis of pedunculated fibroid was made, taking its origin to the left, anterior and somewhat below the fundus, with rather a long pedicle. It was decided to manage this case expectantly. From time to time there were reports of sudden cramp-like pains in this region, lasting for a short time and as suddenly disappearing; also, occasionally, slight spotting appeared. There was nothing noteworthy in the blood pressure, transitory glycosuria was noted from time to time. Pregnancy continued in this way until the end of the sixth month when the patient suffered very severe pain in the region of the tumor. Morphine was given freely, affording only partial relief. The patient was then admitted to the hospital with the appearance of being very ill and suffering acutely. Temperature 101° F., pulse 120 and very high leucocyte and polymorph count. There was well-marked albuminuria with hyaline and granular casts. Marked tenderness was evident over the site of the tumor and for a considerable area about it. There were no uterine contractions or disturbances in the fetal heart.

The abdomen was opened disclosing a tumor mass, evidently strangulated, about 7 cm. in diameter; two-thirds of its surface was covered with adherent omentum and plastic lymph, a portion of the small intestine was also adherent. These adhesions were easily separated, the pedicle was found tightly twisted one and one-half turns. This was clamped and ligated and the tumor excised. Peritoneum was sutured over the stump and the abdomen closed in layers. Postoperative course was febrile and painful for a few days and thereafter uneventful. There was no attempt at onset of labor and the pregnancy continued to full term when a living child, vertex R.O.P. was delivered by easy low forceps.

Another case of normal uterine pregnancy with a very large pedunculated fibroid: In this instance the pedicle was short, about 5 cm. in diameter, taking origin to the right posterior and just below the fundus. Beyond discomfort and pressure this gave no trouble until early in the seventh month. At this time it was so large that great distress was caused by pressure, especially in the region of the liver. The tumor was removed and the stump treated as in the former case. It proved to be larger than the then pregnant uterus. Characteristic red degeneration was well advanced. Recovery from operation was uneventful and the pregnancy continued to full term.

It is rather surprising how many cases we see of even very large fibroids of the uterus as complications of pregnancy and to note how well the developing uterus will adjust itself to this encroaching mass, especially if the abdomen is large and roomy. It is noteworthy that these tumors diminish in size after labor. Sometimes interstitial fibroids of comparatively small size proved to be the offending agents, causing threat to abort. Many times these can be removed by myomectomy and the pregnancy continue. Dr. Davis was not successful in having pregnancy continue in cases of myomectomy in which a considerable area of membrane has been exposed, for within a very short time the patient aborts, or goes into premature labor. He had many fibroids of the uterus complicating pregnancy in patients upon whom he had performed cesarean section but did not recall that he had ever done a hysterectomy or lost a patient in such cases.

DR. ELIOT BISHOP said that treatment depends on the location of the fibroid. That which seems the most serious is the large *obstructing tumor,* which, grave as it is, suggests its own treatment,—delivery from above. The second location of the tumor is much more common than we would infer from the paper, because, presumably, in most instances, it is inconsequential, and that is the *subserous* tumor, which in some instances causes pain so severe as to need very definite treatment and, in very rare instances, to become necrotic, as Dr. Kosmak reported at a meeting of the State Society a few years ago.

The next location is *intramural,* and here the tumor produces trouble by interfering with that part of the physiology of labor that is insufficiently emphasized—retraction. If the tumor is in the lower uterine segment, retraction is delayed, or often prevented, the first stage refuses to proceed, and section is imperative. If, however, the delivery is accomplished spontaneously, contraction and retraction in the third stage may be interfered with to the extent of a postpartum hemorrhage. Later on, the physiology of the puerperium may be faulty, and subinvolution, with its train of symptoms, develops.

DR. GEORGE W. KOSMAK said that a study of this kind, involving such a large number of cases so closely observed by a single body of men, will undoubtedly be quoted repeatedly in medical literature, because it constitutes a most valuable contribution to the subject. He took exception to the attitude toward myomectomy during pregnancy and believed that fibroids should be regarded more seriously before and after labor than during labor.

Dr. Kosmak referred to a case reported before this Society some years ago, in which myomectomy during pregnancy saved the woman, saved her uterus, and allowed another pregnancy to take place subsequently. This patient was about five months pregnant and her uterine mass reached to the ensiform. She was bleeding slightly, she had a little elevation of temperature and a great deal of abdominal pain. She was in such condition that something had to be done to relieve her. Dr. Kosmak did an exploratory laparotomy, expecting to do a hysterectomy, and found one fibroid in the anterior wall at the fundus, one at one cornu, and another one on the posterior wall, far down, so that this lowermost fibroid really occupied almost the entire pelvic cavity. There was no difficulty in removing the fibroid in the anterior wall and that near the cornu, but it required complete delivery of the uterus outside the abdominal cavity to get at the fibroid on the posterior wall, and this extended down practically to the endometrium.

The three tumors were excised, she went on with her pregnancy and was subsequently delivered. This case was at the Lying-In Hospital. Before that in another case a fibroid as large as a good-sized grapefruit was removed from the fundus of the uterus, near the cornu, which was also accompanied by slight elevation of temperature and extreme pain. She went on to term and was delivered without any difficulty. The first patient was delivered a second time less than two years ago without difficulty whatsoever.

Dr. Kosmak believed if fibroids cause symptoms during pregnancy, including pain and tenderness, slight elevation of temperature, and perhaps bleeding, that we should in all such cases attempt a myomectomy. If after the abdomen is opened, we find conditions are such that it might be more advisable to terminate the pregnancy, we can always do so; but a great many of these women can have their uteri saved for a possible future pregnancy if we pursue this more conservative course.

As to the fibroids after delivery, Dr. Kosmak believed that we are confronted with a more serious situation. In those cases a conservative policy, while it seems to be indicated, is one that cannot always be followed. He had a few cases in which he did a radical operation for sloughing fibroids after labor, with good results. It means if the fibroid is in such a position that you can get at it, it can sometimes be removed without sacrificing the uterus and save the uterus for a future pregnancy, particularly in the young woman. On the other hand, the process may be so extensive that we may have to remove the entire uterus; but his point in making these remarks is to direct attention to the possibility of conservative treatment in the presence of fibroid tumors in which during pregnancy there is a rapid growth and which cause symptoms and where especially in the young woman, we do not want to sacrifice her ability to bear children subsequently.

DR. R. T. FRANK said that the viewpoints so far submitted seemed to have come largely from the obstetricians. He thought that those who see these cases earlier look at them from a slight different standpoint. If asked to determine whether it is safe for those women to go through labor, there is no harder question to answer when such a woman presents herself in the second or third month of pregnancy. Just as Dr. Kosmak has said, and Dr. Bishop, too, when the tumors obstruct the pelvis, the answer is easier to give. In other cases it always is advisable to suggest waiting, under close observation, for a month or two and see the rapidity with which these growths increase. We all know they are apt to slow up after the fourth month, but, again and again, by the time the fourth month it reached, the question has answered itself. If by that time the pregnancy occupies one-third of the mass and the fibroid two-thirds, he thinks the likelihood of such a patient carrying to term is extremely small. Furthermore, he thinks the most favorable time for myomectomy, (and in this he agreed with Dr. Kosmak) in many cases should be considered as around the fourth month.

Dr. Frank referred to two striking cases where in doing a myomectomy he saw the fetus shining through the membranes. The endometrium was actually partly injured in the enucleation of the tumors. Both those cases went to term, and one of them has had a second child since then without the slightest trouble. If we find at the fourth month that enucleation of the tumors jeopardizes the likelihood of carrying the fetus to term to such a degree that an immediate abortion is likely to occur, it is perfectly feasible to empty the uterus and then sew it up as if you were dealing with a cesarean section at term, and with the exception of one case, where there was a very advanced thyroid condition present, no fatality occurred in all the cases Dr. Frank treated in that fashion at this early period of pregnancy. On the other hand, if you open the abdomen, particularly in multiparae, and find the conditions for myomectomy are so unfavorable that the likelihood of carrying through on account of the fibroids occupying a large part of the entire mass is small, Dr. Frank would not hesitate to do a hysterectomy.

DR. S. H. GEIST referred to a primipara in the fourth month of pregnancy (upon whom he had done a myomectomy). She went into labor normally and delivered herself spontaneously of a seven-pound male child. She had a retained placenta and finally it was necessary to remove it manually. He found the placenta perfectly free except along a straight line from fundus half way to cervix. Dr. Geist found that for a distance of seven centimeters in length and one and a half centimeters in width, there was no evidence of placental tissue, but simply a thin shaggy scar where the placenta was attached. In the removal of the fibroid the circulation of the endometrium, or rather the decidua, had been so interfered with that it was replaced by scar tissue, and the condition was practically a placenta accreta.

She had a second baby later without any difficulty with the placenta.

DR. WILLIAM P. HEALY said that pregnancy going to term is unusual in women having fibromyomatous tumors. Therefore, when we come across a patient who is pregnant and who has a fibromyomatous uterus, we should bear in mind that this may be the only pregnancy, especially if it is her first one, that she may ever carry to term, and we ought to approach it very conservatively. If it is in the first four or five months of gestation and the number of tumors is not great, and the location is such, as in the case mentioned by Dr. Ward where there is an incarcerated, retroverted or retroflexed uterus with a tumor lying anteriorly, the woman is going to abort if you do not do something to get the uterus out of its malposition, and that means removing the tumor, and you may save the pregnancy for her. He considered it better to do the myomectomy in the presence of the pregnancy and take the risk of a possible subsequent spontaneous abortion, rather than to interrupt the pregnancy with the idea of doing a myomectomy later and hoping that then she will conceive and go to term. On the other hand, if you have a large number of myomata in the uterus, it is infinitely better to leave the patient alone with her pregnancy, because, as has been mentioned by the reader of the paper and by Dr. Polak and most of the speakers, we are constantly amazed to note how apparently impossible conditions are overcome spontaneously in the normal growth of the uterus with the pregnancy.

DR. PIERSON (closing): Dr. Polak spoke of the use of the bag as being practically never indicated for the reason of fibroids alone. We had eight cases in this series of 250 in which a bag was used, but only one case in which it was used because of the fibroids. In that case, it was ineffective.

As for the viewpoints of Dr. Kosmak, Dr. Frank, and Dr. Ward in respect to myomectomy during pregnancy, Dr. Pierson agreed that there are cases in which myomectomy may be properly done, but that conservative treatment is wiser in the majority of cases, for the reason as mentioned by Dr. Healy and Dr. Rubin that it may be the patient's last chance to have a child. For experience shows that, many times, the attempt at conservative myomectomy during pregnancy has to be abandoned because of difficulties arising during the procedure, so that finally hysterectomy is done.

Dr. Geist's report of a case in which the placenta was adherent to a former myomectomy scar is interesting. There were 15 cases of adherent placentas in this series of 250. This is, however, a clinical and not a pathologic diagnosis. It is probable that only a few of these cases were true adherent placentas.

Dr. Rubin spoke of the relationship of fibroids to sterility. No report was here included of the cases upon which myomectomy was done as a treatment of sterility. Dr. Rubin spoke also of the time of election for doing myomectomy from the standpoint of improvement of errors of reproductive capacity. This is a very important and difficult problem. Dr. Pierson was reminded of a case first seen at about the sixth month of pregnancy with an anterior intramural fibroid about 5 cm. in diameter. This patient aborted at six and one-half months. With involution of the uterus the tumor disappeared. The patient, in a few months, wanted to know if she should again become pregnant. The late Dr. Studdiford agreed that since no tumor was palpable, she should be allowed to become pregnant. Pregnancy occurred promptly and the fibroid reappeared at about the fourth month. At five and one-half months, she again had an irritable uterus and threatened premature labor. The patient was put to bed for the rest of her pregnancy. Even so, there was premature rupture of the membranes at the eighth month. Fortunately, her five-pound child survived. Such an experience makes one wonder if one would be justified in such a case in doing a myomectomy in the puerperal period, or shortly thereafter, in order to improve the patient's future reproductive capacity. The tumor just described has again involuted with the uterus, so that it cannot now be felt.

OBSTETRICAL SOCIETY OF PHILADELPHIA

STATED MEETING, DECEMBER 2, 1926

DR. B. P. WATSON, of New York, by invitation, presented an address entitled **The Responsibility of the Obstetrical Teacher in Relation to Maternal Mortality and Morbidity.** (See page 277.)

DISCUSSION

DR. RICHARD C. NORRIS said that it seemed in this country, in recent years, that better results are obtained by increasing more and more our hospital maternity work. We are urging more and more women to go to hospitals for their confinement for the benefit of the woman herself as well as the practitioner of obstetrics. The trouble with the system of cooperative or teamwork of a specially trained nurse and a doctor, in remote districts, is that the work, practically, would largely fall to the associated trained obstetric nurse. I am not sure that our Public Health Service, which is demanding more and more the services of the trained nurse as a substitute for the rapidly decreasing country doctor, is not making the public service nurse a higher type of midwife. The midwife problem we have tried to get rid of but find, practically, we cannot do it. If the country doctor cannot be a trained obstetrician, which seems to be a fact, this work must fall into the hands of women properly trained for it, whether you call her a trained obstetric attendant or a higher order of midwife. It is impossible to have the doctor in the outlying districts in attendance on two or more women actively in labor at remote distances from each other. The more practical plan is to increase everywhere community maternity hospitals, even in outlying districts. To educate a group of graduate nurses as obstetric attendants, and attempt to have them cooperate with country doctors, would ultimately lead to the nurse replacing the doctor, if they exhibited, as they probably would, the self assurance and attitude of the modern trained nurse. He should prefer the slogan of "more obstetric hospitals" rather than "more trained nurses to do the doctor's work."

DR. L. S. COGILL wondered what effect—in the near future—periodic health examinations are going to have upon these statistics.

If we do follow-up work during the entire so-called childbearing period of the woman instead of merely during the prenatal stage, we can check up much earlier any existing pathology, which otherwise would result in ill health or death of mother or infant.

If the infant is followed through health clinics from birth to motherhood, much needless pathology will be avoided.

This plan properly carried out, plus good care at birth should tend toward reduction of the present maternal and infant morbidity and mortality.

DR. P. BROOKE BLAND said that Dr. Watson's paper has placed the stamp of approval on the teaching of obstetrics in Philadelphia institutions and the plan he has outlined is being followed today. The mind of the medical student, the prospective general practitioner of medicine, who must of necessity be 33 per cent obstetrician, must be inculcated with the well-known truth that the successful practice of obstetrics resides, first, in zealous prenatal supervision, so aptly described or named by Holland, "The Strategy of Obstetrics," and, second, in pursuing during labor an aseptic watchful waiting plan, as mentioned by Dr. Watson. Hasty manual or indiscriminate instrumental and abdominal delivery have combined to contribute to the unusual or the exceptionally high mortality and morbidity in this country. To all familiar with the present situation it is quite obvious that something is woefully wrong in our obstetric work and it is equally obvious that something must be done, some plan inaugurated, to reduce or eliminate the present day high morbidity and mortality.

DR. GEORGE M. BOYD was impressed with the conservative viewpoint taken throughout this address and was fully in accord with his counsel as to the wisdom of testing the stages of labor, keeping in mind the fact that the primipara may go 24 hours and the multipara 12 hours without developing dystocia. In 1921 he reviewed 10,642 consecutive cases delivered in the Philadelphia Lying-In Charity. This report was prompted by the feeling that many obstetricians exercised too great haste in labor and too often resorted to surgical interference. The report was made to determine the frequency of spontaneous delivery and also the maternal and fetal mortality. It was found that if the time element was observed, in 90 per cent of the cases the labor was spontaneous and that surgical interference was reduced to the minimum. By following this course there was a fetal mortality of 5.39 per cent. A study of 10,000 cases in 1915 made by the Sloane Hospital for Women, New York, the Columbia Hospital, Washington and Johns Hopkins Hospital, Baltimore, showed about the same fetal mortality.

DR. WILLIAM R. NICHOLSON felt that it would be not an unmixed evil if men were sent out from the various medical schools of the country without any knowledge of the so-called "high application of the forceps." The indication for this operation is very rare, and most of the cases subjected to it either should have been cesareanized or should have waited for a longer test of labor.

It is impossible to teach the differential diagnosis between these two classes of cases to a man in his undergraduate course, and it is also impossible to teach these to a short term interne.

He thoroughly agreed also that too little time is given to the teaching of obstetrics in the medical schools today and was convinced that much of the time spent on the benches or assisting at gynecologic and obstetric operations, is pure, sheer waste, and that if the time now devoted to this useless activity were devoted to the actual study of prenatal cases, together with the use of the midpelvic and low forceps, that the student would benefit, to say nothing of the added safety to his patients.

With regard to the question of the midwives, there is, of course, in this country, not the least danger that the better class of patients will ever be in the hands of the midwife, and no nation, as yet, has ever been able to get away from the midwife, and the trend on the Continent and in England, has been to improve the knowledge of the midwife, in order that she may care for her patients with less danger.

It is not the time nor place to quote midwife statistics, but the Pennsylvania mortality and morbidity percentage compared very favorably with those furnished by a similar collection of cases delivered outside hospitals.

The plan of inspecting each case after delivery is the only feasible plan to insure good care and the expense incurring in this plan is very much less to the state than it would be if these women were all hospitalized.

DR. WATSON (in closing) said that in Edinburgh the clinical material in hospitals was being used almost entirely for the midwife to the exclusion of the medical student, and one of the first addresses he gave in Edinburgh was a protest against the midwife. In the four years he was there, he changed his opinion because he found that the properly trained midwife was filling a place in the community. In the large working communities in Britain where men earn a bare living wage, where both doctor and nurse cannot be paid, where there is not sufficient hospital accommodation to provide for every confinement, the midwife does good work. She would do still better work if she always cooperated with the doctor. Dr. Watson was very much struck with the enthusiasm of certain busy practitioners in mining areas and manufacturing towns who had employed in their practice trained midwives. The doctor exercised prenatal supervision; the midwife did the actual delivery, only calling in the doctor when necessary. The number of instrumental deliveries was greatly reduced and the doctor himself had more leisure. Dr. Watson quite agreed with Dr. Norris that to have sufficient hospitals to accommodate every woman in labor would be the ideal solution of the problem. That is going to take some time and we must be feeling out in all directions to meet the present situation. In regard to teaching students, we must get back to essentials, we must teach clinically. Students must know biochemistry and metabolism and the various laboratory tests, but don't let us have them depend on these things to the exclusion of simple clinical tests. I believe that we must go back more and more to the old method of making them listen, inspect, palpate, auscultate, and make up their minds about the whole clinical picture, using laboratory methods to fill in the blanks and complete the diagnosis.

NEW ORLEANS GYNECOLOGICAL AND OBSTETRICAL SOCIETY

MEETING HELD FEBRUARY 10, 1927

DR. A. F. HEBERT reported a case of **Emphysema Following Labor.**

The patient, a white woman, was admitted in hard labor and was delivered spontaneously shortly thereafter. About an hour and a half after delivery, and some three-quarters of an hour after she had begun to complain of pain and swelling in the left side of her neck, she was examined by Dr. Hebert, who made out a distinct area of emphysema in this region. The process continued to spread along the line of the sternomastoid muscles and under the pectorals, down to the tip of the sternum. On the day the report was made it extended as far as the elbow. X-ray examination was negative, her general condition seemed good, and recovery was expected.

Dr. Hebert had seen no similar case before, and on inquiry found that Dr. C. Jeff Miller had seen but two and Dr. J. W. Newman but one. He had not investigated the literature, but mentioned that DeLee ignored the condition in his textbook. The interesting feature of the case was its occurrence so soon after a normal labor, with no explanation of the etiology.

DR. HILLIARD E. MILLER recollected that two years ago a case similar to this in the area involved was reported in *Surgery, Gynecology and Obstetrics.* The author believed that he was reporting a unique condition, but the following month the editor of this Journal (G. W. K.) called his attention to some forty similar cases in the literature, and gave a full list of references.

DR. T. B. SELLERS reported a similar case treated by him five years ago. The patient, a primipara, developed the condition during the time she was in hospital undergoing treatment for pernicious vomiting, of so severe a type that it finally responded only to repeated intravenous infusions of glucose. She was originally a very large woman, and the emphysema, which involved the head, neck and chest, distorted her almost beyond recognition. The condition cleared up spontaneously within a few days, but two and a half months later she miscarried for no apparent reason.

DR. B. C. GARRETT read a paper entitled **The Evolution of the Low Cesarean Operation,** condensed from DeLee's paper before the American Gynecological Society in 1925.

DISCUSSION

DR. PHILLIPS J. CARTER stated that he had performed this operation first in five cases on the service of Dr. C. Jeff Miller in Charity Hospital from 1915 to 1917. All of the patients had been examined on the outside, in two cases forceps had been attempted, and all of them in his opinion were definitely infected. Drainage was done in all cases, in all the convalescence was definitely febrile, but in spite of the unfavorable circumstances, only one patient died, of a low grade peritontitis. He believed that it should be emphasized that even the present type of operation is intraperitoneal, though the suturing of the flaps of peritoneum to the parietes makes it more definitely extraperitoneal than any of its predecessors. He emphasized the fact that it was important to make the uterine incision long enough to permit extraction of the head without difficulty after forceps had been applied, since otherwise an uncontrolled tear with severe hemorrhage might result.

DR. B. C. GARRETT, in closing, stated that within the last year he had used mercurochrome in the preparation of all his obstetric cases, as well as his vaginal surgical cases, but that the change from the former preparation with alcohol had been too recent for him to state comparative results. He doubted the value of morphia before operative delivery, at least from the standpoint of the child, and cited one case of his own in which the child was nearly lost as a result of the administration of this opiate immediately before delivery. He also doubted the value of iodoform gauze within the uterus, and cited a personal case in which, in spite of the routine washing of the iodoform gauze, as was his custom, the patient had had an extreme elevation of temperature over a period of several days, which could only be attributed to too much iodoform. In his opinion the best way to stop uterine bleeding after cesarean section was to close the uterus promptly, and then rely upon pituitrin and ergot. The repeated cesarean operation presented no difficulties when this technic was employed, he had personally employed it three times on the same patient, and believed he would probably have to use it again in her case, since, in spite of his advice, she had refused sterilization at the last operation.

DR. LUCIAN A. LEDOUX reported a case of **Postoperative Rupture of the Uterus After Cesarean Section.**

Lillian S., aged 19, primipara, was admitted to the New Orleans Charity Hospital April 13, 1922, and died there April 26. When first seen she had been in labor about two hours. The general physical examination was negative. The pelvis was of the generally contracted type, and a marked disproportion was present. The fetus, which was in the L.O.A. position, was alive, the heart rate being 140. The cervix was soft and one finger dilated. Nine hours after admission, when further cervical dilatation had been secured by fairly good, though by no means continuous uterine contractions, cesarean section was done under ether anesthesia by the classical technic, after the vagina and cervix had been thoroughly iodinized. The child was delivered alive and in good condition, one c.c. of pituitrin was administered prior to incision of the uterus, and the uterus was closed in three separate layers by continuous chromic No. 2 sutures, the fascia and peritoneum were closed with the same suture material, and the skin was closed with silkworm sutures. Drainage was not indicated. It might be added that the uterus was well contracted when abdominal closure was begun.

The patient reacted well from the operation and her convalescence was entirely satisfactory for several days; the temperature ranged from 99° to 101,° and the pulse from 70 to 92. There was an occasional complaint of low abdominal pain. The lochia were normal in amount, color and odor, and the abdominal wound, when dressed, seemed in good condition.

April 21 the temperature rose suddenly to 104° and the pulse to 118, accompanied by severe abdominal pain, marked distention, and nausea and vomiting. The lochial discharge continued normal in color and amount, but the odor was now very foul. Her condition grew progressively worse until her death April 26, on the twelfth postoperative day.

The cause of death was evidently puerperal sepsis and general peritonitis, the origin of which was revealed by the autopsy performed by Dr. Rigney D'Aunoy through the abdominal incision, which inspection revealed to be in satisfactory condition, complete union having occurred.

The final diagnosis read general peritontitis secondary to postoperative rupture of the uterus, acute nephritis and focal necrosis of the liver.

DISCUSSION

DR. LEDOUX added from his own observations made at autopsy that the edges of the uterine rupture were definitely gangrenous and the amount of catgut remaining was small. The rupture included the entire length of the original incision and was quite irregular. The serous surface of the uterus appeared fairly normal. The whole picture was one of intrauterine infection, ascending in character.

DR. E. L. KING said that possibly many similar cases passed unrecognized, although he personally knew of none in which the uterine rupture had occurred so soon after operation. In discussing suture material and methods of suturing the uterus, he said that while most surgeons used continuous sutures, it must be remembered that with the process of involution the original uterine incision was considerably smaller at the end of eight or ten days, and therefore the sutures would not hold as tightly then as if the incision remained the original length. Some authorities advocate interrupted sutures, believing that if one breaks, the others will hold.

DR. C. JEFF MILLER questioned the wisdom of calling this particular case a rupture of the uterus; to him it seemed simply an evidence of postoperative infection, with results similar to those which would follow such an infection elsewhere. He believed that the method of suturing the uterus had nothing to do with the results, since it seemed hardly conceivable that any surgeon could have been responsible by an error in technic for the failure of three lines of sutures to hold.

DR. LEDOUX, in closing, said that it was now his custom to use interrupted sutures for the middle line, but that if infection were present he did not believe this would materially alter the results. The interesting feature in this particular case was the inclusion of the entire uterine wound in the infection, plus the fact that the rupture occurred on the eighth day, after an apparently satisfactory convalescence.

DR. URBAN MAES (by invitation) read a paper entitled **The Differential Diagnosis of Right-Sided Abdominal Pain.** (See page 364.)

DISCUSSION

DR. E. L. KING stated that he had seen recently three operations performed in girls of twelve or thirteen years on a diagnosis of acute appendicitis, perfectly justifiable in view of the history and physical findings, in each of whom operation disclosed an ovarian cyst with twisted pedicle, a condition which could not have been suspected beforehand unless rectal examination, which did not seem warranted, had been made. In those cases in which rupture of the tube occurred into the peritoneal cavity, the syndrome was usually so definite that diagnosis presented few difficulties. He recalled one case he had seen some years ago in Paris, in which the patient was curetted on a diagnosis of uterine abortion, and preparations were made to perform hysterectomy, according to the French custom in puerperal infection, when her temperature rose to 100° shortly thereafter, but when laparotomy was done, a tubal abortion was revealed; a postoperative review of the history made the diagnosis perfectly clear. Vaginal examination was not always helpful, particularly in the obese patient, with the tubal mass small. In one instance he had been so uncertain of the diagnosis that he was obliged to curette the uterus and have the scrapings examined for chorionic villi before he could decide that a uterine abortion and not a tubal pregnancy was present. He had personally never seen the bluish discoloration about the umbilicus, mentioned by Cullen as a diagnostic sign, nor had he seen the shoulder pain mentioned by some French writer as indicating extensive hemorrhage after tubal rupture.

DR. HILLIARD E. MILLER said that he had personally within the last two months operated on two women for pus tubes who a few months before had had emergency laparotomies for supposedly acute appendicitis; in each instance no vaginal examination had been made, and the appendix was removed through a McBurney incision, without exploration of the pelvic contents. He recently had removed an apparently normal appendix in a child of three in whom the history and physical findings were typical of acute appendicitis, when all other conditions, including chest pathology, had been eliminated, as he was assured by the pediatrician who called him in consultation. He believed that if an x-ray had been made before operation it would have revealed the pneumonia which was quite evident the following day.

DR. C. JEFF MILLER believed that Dr. Maes' paper was to be commended because of its excellent balance, in that it emphasized the urgency of these abdominal conditions, rather than refinements of diagnosis. In his opinion the important point to bear in mind in the management of acute abdominal conditions was that, valuable as laboratory examinations and similar details of diagnosis were ordinarily, they had small place in these conditions in which prompt diagnosis and prompt treatment were the only methods of averting tragedy. In tubal pregnancy he had frequently seen patients profoundly shocked in whom the hemorrhage had been small; personally he had seen Cullen's sign but twice, once in a case of tubal pregnancy, and once in hemorrhage from sarcoma of the intestines. He did not believe it wise to wait for detailed examinations of the blood in such cases. In his experience the most valuable sign of rupture was the presence of generalized tenderness in the vaginal vault, although he was not aware that the average textbook laid any stress upon this point.

DR. MAES, in closing, said that while ureteral stricture and ureteral stone occasionally appeared in the category of acute abdominal conditions, ordinarily preliminary urinalysis would establish the diagnosis; however, he had personally seen three cases in which the abdomen was opened on a diagnosis of acute appendicitis, an apparently normal appendix was removed, and subsequent operation had to be done for a stone in the ureter at the brim of the pelvis. Purposely he had avoided the use of the word shock; in the ordinary acceptation of the term, shock is not present in the early stages of an acute abdominal condition, but collapse sometimes is, especially when hemorrhage is present. He also believed that the presence of the so-called abdominal facies was a most important diagnostic aid.

Robinson: Prenatal Care and Puerperal Mortality. The Lancet, 1923, ccv, 649.

The fact that there has been no appreciable reduction in the maternal mortality from childbirth during the last fifty years may be explained on the basis that modern advances in obstetrics are not in general use. In support of this contention the writer gives the causes of death in childbirth and shows the extent to which these morbid processes are associated with recognizable warning symptoms during pregnancy and further that such prodromes are largely amenable to preventive treatment.

He believes that the majority of puerperal fatalities belong to the class of preventable disease, and therefore, that maintenance of the present high puerperal death rate is primarily due to the neglect of the principles and practice of preventive medicine, and only by general adoption of prenatal care can any serious reduction of puerperal mortality be effected. NORMAN F. MILLER.

Füth, H.: Prolongation of the Legal Period of Gestation. Monatsschrift für Geburtshilfe und Gynäkologie, 1923, lxii, 87.

Ruge recently declared that up to the present time there is no unquestionable case on record of a living child having been born after a gestation period of more than 302 days.

Füth reports three cases in which the pregnancies lasted more than 302 days. The minimum periods for these cases were 329, 313, and 308 days. The author agrees with those who maintain that the accepted legal maximum period of gestation should be extended. J. P. GREENHILL.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

THE GYNECOLOGIC LITERATURE OF 1926

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THE year 1926 marks but little advance and progress in gynecology. The purpose of menstruation, the etiology of malignancy, and the many important physiologic processes of the reproductive organs with which we are particularly concerned comprise but a small part of the voluminous literature. The fuller understanding of these problems seems to us to be the goal of gynecology.

The etiology of malignancy remains untouched. Some advances have been made in the physiology of menstruation, but too many functions are attributed to the comparatively unknown ovarian hormones. Real constructive advances have been made in the study of sterility.

Regret as we may, new operative procedures on the uterine ligaments have already fallen far below the ancient standard. The endometrium has also shared in fewer abuses from the curette, except from a few new uterine endoscopes. However, the cervix has received more attention than in previous years. The treatment of endocervicitis with the cautery and other electrical devices is the outstanding topic in the literature of 1926.

GENERAL PROBLEMS

Charitable excuses may be made for additional aids in the diagnosis in gynecology. With the rapid strides in the various medical sciences, biochemic knowledge and refined laboratory technic are rapidly furnishing the gynecologist and specialist with diagnostic methods of precision and indications for treatment, based upon highly technical and refined methods, where but a few years ago common sense methods afforded the sole basis of treatment. We feel compelled to state our belief that much mischief is done to the specialty of gynecology by the addition of these new methods of diagnosis and treatment to the already large equipment necessary for the practice in this branch of medicine.

Thompson[1] advocates transillumination of the cervix as a simple procedure that should be done as a part of the routine of a pelvic examination. Cystic conditions of the cervical glands are said to be detected, which very often are not revealed by ordinary examination. A remarkable fact of interest!

Neuhof and Cohen[2] suggest abdominal puncture as an aid to diagnosis in every acute intraperitoneal lesion for which operation may be indicated. The authors consider this procedure to be a simple, safe, and valuable aid in the diagnosis of acute abdominal disease. This hopeless suggestion does not seem to us to be warranted.

Fuss[3] concludes from his material of 516 cases that the Ruge II and Philipps virulence test furnishes a reliable warning sign of the prognosis in operative cases. A positive test indicates great probability of grave infection.

In a careful study of Philipps' virulence test with vaginal and cervical germs in 105 cases, Pribram[4] arrived at different conclusions. In this series of cases all women with highly virulent streptococci recovered smoothly; some of those with "avirulent" germs had stormy postoperative complications.

In the group of pelvic infections due to gonorrhea, Patterson[5] states that routine microscopic methods fail to detect most chronic gonococcal infections in women, while cultural methods may give a positive finding missed by the microscopic examinations. The complement-fixation test of blood of suspected cases of chronic gonorrhea gives the highest proportion of positive findings.

It appears that the sedimentation test has received more careful study during the past year. Rubin[6] sees in it a more reliable indication of the condition of the patient than in the temperature chart or leucocytic count. Its diagnostic and prognostic values are secondary to its value in indicating the acuteness of a process. Cherry[16] in a study of the sedimentation test in 71 cases concludes that while it may be an important factor, as a diagnostic agent alone it is untrustworthy in pelvic conditions, and that the leucocytic count is a more reliable indicator of the degree of virulence of the infecting organism, and more dependable as a means to determine the most suitable time to interfere surgically. Schmitz[17] concludes that the sedimentation test is not an aid in the determination of the time of safe operability of adnexal inflammations.

Graves[7] emphasizes the necessity of preserving the full function of the pelvic organs in females under maturity because of their influence on the general development. After the age of maturity, the preservation of reproductive ability is the prime consideration. If this is impossible, every effort should be made to maintain the full menstrual function. Graves removes the ovaries chiefly because they may produce trouble later as the result of cystic degenerations, adhesions, or malignant changes.

Lynch[8] has found that sacral or sacrolumbar backache was a complaint in 49 per cent of 1,041 women who came to gynecologic operations with lesions of the pelvic organs. In 510 cases in which it was a preoperative symptom, 76.5 per cent remained cured for periods ranging from one to eight years. It appeared that backache in gynecologic conditions was due chiefly to pelvic congestion. Schroeder[9] is of the opinion that deep backache is often due to a chronic lymphanigitis or to a contracture of the sacrouterine ligaments and is often due to erosions of the cervix.

Van de Velde[10] believes that much unhappiness could be prevented if sexual infantilism were corrected before marriage so that sexual life would be normal from the first. Organotherapy, diathermy, and vibration massage of the uterus proves successful in many cases.

It is scarcely to be supposed that increased circulation due to diathermy will correct an inherent faultily developed organ. Much caution must be exercised in the interpretation of these results.

Clinical results of diathermy in gynecology are not always as favorable as claimed by the advertisers of such. Cherry[12-13] reports results in 77 patients with pelvic masses. Of these, 49 were entirely relieved of symptoms, operation being unnecessary or refused by the patient. The question may properly be asked: if these patients were cured, why was operation suggested?

Seymour[14] discusses endoscopy of the uterus as a diagnostic aid in uterine lesions. This is the most appropriate place to refer to the established view that the routine introduction of instruments into the uterus is mischievous.

Meyer and Kaufman[15] discuss the value of biopsy in gynecology. A vast array of accurate data has been accumulated by this comparatively simple operation. Of 146 cases in which a portion of the portio was removed for histologic examination, carcinoma was found in 26. In only 15 of this group had the clinical diagnosis been made. In two cases of this series the microscopic examination revealed cancer when it was not even suspected. Meyer and Kaufman do not beileve that biopsy favors the spread of carcinoma and do not recognize the theory of the so-called precarcinomatous state.

VAGINA AND CERVIX

In a study of the vaginal reaction in the newborn before any bacteria had time to develop Kienlin[19] found lactic acid present, and he attributes its presence to fermentative action of the tissue itself. Lash and Kaplan[20] examined the vaginal flora of 98 pregnant women by means of smears and cultures and found the Döderlein bacillus present in 41 instances. Four strains were isolated but all were serologically similar. Meaker[21] gives a historic review of the vaginal douche, and believes that this common item of pelvic therapeutics is the most worthless if not positively harmful. Except for cleansing purposes before operations, this procedure should become obsolete in the near future. When employed in the presence of infections, it only serves to spread and disseminate the organisms.

Miles[22] gives an interesting classification of hernias of the vagina with methods of treatment. Glassman[23] has published a very ingenious method for the cure of deep culdesac and vaginal hernias or for vaginal enteroceles. This procedure appears to be based on sound anatomic grounds.

The various methods for the treatment of endocervicitis have passed through many phases of progression and degeneration since the early nineties. We do not wish to accuse our eminent predecessors of ignorance with regard to the histologic or pathologic findings in the cervix, yet the teaching and practices advocated are not difficult to comprehend in our times. Painting of the cervix with red dyes (mercurochrome) has supplanted the blue color of methylene blue. The coagulations and different methods of medical diathermies (with special types of apparatus) have supplanted the old destructive method of zinc chloride. And the electrocauterization of the cervix has partly replaced the surgical procedures of amputation. These various new procedures are destined to broaden and ultimately will embrace other pelvic organs before we realize and see the conservative pendulum swinging back to common sense.

Walther and Peacock[24] seriously object to the amputation of the diseased cervix on account of scar tissue which seriously interferes with subsequent labors. The authors state that the gonococci may be effectively killed without injury to the tissues by diathermy and report the cure of 12 acute and 26 chronic cases. Mikels[25] believes that electrocoagulation is the most conservative method of treating inflammatory lesions in the region of the cervix and is the greatest safeguard against the development of secondary malignancies.

We cannot concur in this belief as the cause of malignancy is still unknown.

C. Jeff Miller[26] gives a very clear and concise discussion of endocervicitis with its many etiologic causes. While a large percentage of cases are undoubtedly due to specific infection, yet there is another group in which the etiology is still far from clear. Matthews[27] gives the results of 226 cauterizations performed without anesthesia. Of these, 180 were cured and 46 improved. The results of 70 total excisions were: 49 cases cured, 16 improved, and 5 not improved. Culbertson[28] gives a very clear and concise description of the causes of endocervicitis. He is of the opinion that erosions are the direct result of excessive discharge, and that changes in the alkalinity or acidity of the discharges are important factors.

Fulkerson[29] analyzed 1,039 cases of endocervicitis. This condition was noted in 33.16 per cent or one-third of all gynecologic patients. Traumatism of labor and abortions appear to be the chief factors, and accounted for 80.1 per cent. Fulkerson accepts the cautery as the standardized method of treatment and reports 65.3 per cent of cures. Davis[30] believes a large percentage of cervical disease is overlooked through neglect of the use of the vaginal speculum in the routine examinations. Results are given in 317 cases treated by the cautery method. This treatment is not recognized as a cure all, but the author believes that it should supplant cervical operations in most cases.

In a very constructive discussion of syphilis of the cervix, Gellhorn[31] again calls our attention to the frequency of this condition. Primary, secondary, and tertiary lesions are described. The tertiary lesions are of much importance as they give rise to symptoms of discharge, bleeding, and resemble carcinoma to such an extent, that many patients have erroneously been subjected to unnecessary and dangerous operations. Cron[32] reports two cases of syphilis of the cervix (chancre) and is of the opinion that the primary lesion occurs frequently on the cervix. Its apparent rarity is due to the fact that it is often overlooked and that it rapidly involutes. McGlinn[33] calls our attention to the presence of granuloma inguinale in the northern latitudes. He reports successful treatment with Dr. Abel's antimony compounds. Schochet discussed the prevalence of granuloma in the United States with a tabulation of the cases reported.

Lockwood[34] describes a rare tumor in a child sixteen months old with method of treatment. The microscopic sections revealed a rhabdomyoma sarcoma botryoides. Another rare tumor of the uterus, a hemangioma is reported by Wright.[35]

MALPOSITIONS

Bullard[36] reports on a study of the end-results of 361 operations for prolapse of the uterus in the Woman's Hospital. The Watkins operation was performed on 77 patients with 63.6 per cent complete success, or 96 per cent, if we include those cases with minor defects or symptoms. Although anatomically satisfactory, sixteen patients had bladder symptoms which persisted from three months to several years. Complete failures occurred in 3.8 per cent. The Mayo operation was performed in 50 cases. Complete success was noted in 76 per cent, success with minor defects 94 per cent. Complete failure was encountered in three cases. Enterocele was present in 20 per cent. Of these, 16 per cent had small enteroceles without symptoms and did not require operation. Vaginal hysterectomy was performed in 74 cases: complete success in 78.3 per cent; failures in 4 per cent; total successes with minor defects 95.8 per cent.

Vaginal plastics were performed on patients with first and second degree prolapse in 81 cases. Of these 2.5 per cent were complete failures. Total successes with minor defects were obtained in 97.5 per cent of the cases. There were also 56 cases with first degree prolapses.

The most striking thing about this study of the results of the operations for uterine prolapse is that 95 per cent of the cases are cured by vaginal plastic surgery.

One of the important pathologic factors often overlooked in prolapse is the displacement or prolapse of the bladder from the anterior uterine wall.

Brady[37] reports the end-results of the Watkins interposition operation for prolapse in 56 patients operated upon by Dr. Cullen. Of the 48 patients responding to questionnaires, 45 were relieved of all symptoms. Brady notes that there were no deaths and believes that the interposition operation produces the least shock.

Clark and Ferguson[38] believe that cystography is the most convincing and exact method of showing the deformity of the bladder that occurs in cystocele and descensus, and the degree of anatomic reposition of the bladder obtained with various operations. The authors report the finding of eight cases with preoperative and postoperative cystograms showing the position and shape of the bladder.

Danforth and Galloway[39] investigated the frequency of retrodisplacement in a series of 1,000 private patients. Of these 18.8 per cent had retrodisplacement during pregnancy and puerperium. Danforth emphasizes that the importance of retrodisplacement as a pathologic entity as the cause of abortion and sterility is much less than commonly believed. Of this series, 9 per cent were cured with postural treatment and exercise.

A careful study of this subject indicates the faulty conclusions prevalent concerning the retroverted uterus. Meyer-Wirz[40] believes, contrary to other gynecologists, that a movable retroflexion may be the cause of various symptoms, and should be corrected by pessary or Alexander-Adams operation.

We must not forget that over 20 per cent of women normally carry their uteri in a retroverted position, and that advantage should not be taken of this fact for pelvic engineering. The late Doctor Watkins said: "The round ligament operation seems to have ceased to be a subject of much general interest."[41]

ENDOMETRIOSIS

Sampson[42] is of the opinion that pelvic peritoneal endometriosis is usually due to the escape of menstrual blood into the peritoneal cavity with a subsequent local reaction, and with implantation of fragments of uterine mucosa at these points. Novak[43] reports a histologic study of many hundreds of fallopian tubes with particular reference to their contents. In seven tubes particles of uterine mucosa were demonstrated lying free in the lumen. None of the women from whom these endometria containing tubes were removed were menstruating at the time. In none of these cases did the endometrium in the tubes show the characteristic picture of endometrium thrown off at menstruation. In at least five of the cases the particles of free endometrium were so large that it seemed almost impossible for them to have entered the tiny uterine orifice of the tube. The suggestion that they were probably moving toward rather than away from the uterus is strengthened by the finding of definite endometrial tissue in the ovary in at least two of the five cases.

Thirteen observations made in the course of operations upon women who were menstruating and whose tubes were opened failed to show regurgitation of menstrual blood in a single case. No blood has apparently been observed in the pelvis in the thousands of women operated upon by thousands of surgeons immediately after menstruation, and if any menstrual blood had escaped into the pelvis it could scarcely have been resorbed in such a brief space of time. It seems logical to conclude therefore that while regurgitation through the tube is possible, it is exceedingly infrequent, too infrequent to explain such a very common lesion as pelvic endometriosis. Moreover, it appears incredible that degenerative tissue could thread itself into the tubal orifice, make its way upward, and after probably many days, still have sufficient vitality to grow where it falls. This is especially impossible because of the very rapid autolytic and degenerative changes that occur in the tissue cast off during menstruation. Novak is of the opinion that if implantation of the endometrium occurs, as it well may, it is the ovary from which the seed is primarily dropped rather than from the tube.[44]

Davis and Cron[45] report nine cases of endometriosis, one in which the endometrial implants were probably due to transuterine inflation. Heaney reported six cases of endometriosis, three of which followed a laparotomy. Danforth states that he has observed the escape of menstrual blood from the fallopian tube during menstruation. Curtis has also observed this condition in three cases.

White[46] reports a case of decidual reaction in an adenomyoma of the rectovaginal septum.

Many cases of endometrioma are being reported in the literature, but there is one fact about which there can be no doubt, namely, that we do not know the true etiology of endometriosis.

MENSTRUAL DISORDERS

Novak[47] calls attention to a definite group of cases of menorrhagia in which the endometrial scrapings present an increase of stroma and glandular elements with a very characteristic Swiss-cheese pattern. This group offers a difficult problem especially in young patients in whom the child-bearing period must be seriously considered. Repeated curettage brings only temporary relief until the endocrine balance is restored. In those who are near the menopause or have had offspring, radium therapy or hysterectomy is indicated. Whitehouse[48] analyzed 200 consecutive cases of functional uterine hemorrhage with no obvious physical signs, and concludes that the normal regular menstruation is the monthly abortion of the decidua of an unfertilized ovum. The author classifies this excessive menstrual flow into four groups and believes that one type is due to a functional hyperthyroidism or hypersensibility of the sympathetic nervous system.

We do not know why women menstruate, as this is the only known physiologic process in the body that is associated with hemorrhage. It seems that too many unknown conditions are attributed to the sympathetic nervous system. In another contribution on menstruation, Whitehouse[49] considers the premenstrual dilatation of the uterine glands as artefacts due to constriction of the ducts by the stroma. This appears at variance with our newer conception of the development of the uterine glands by the process of budding from the basal layer.

Biedl[50] discusses the characterization of puberty from the viewpoint of the prevalence of different endocrine glands at various ages. It is difficult to understand clearly this contribution unless we wish to enter speculative medicine with the supposed actions of the endocrine organs or groups of interrelated endocrine organs on the organism. Fekete[51] studied 19 cases of uterine hemorrhage in young girls and concludes that a large percentage of the patients presented objective evidence of lowered ovarian function; that the direct cause of long-continued bleedings are disharmony between the mucous membrane, undeveloped musculature, the instability of the vasomotor system, and possibly an abnormal composition of the blood. Here again we wish for more concrete facts and data.

Forsdike[52] reports excellent results in the treatment of 200 cases of idiopathic or essential uterine hemorrhage with radium therapy. Schmitz[53] gives the clinical characteristics of menstruation and uterine hemorrhage in 1,200 women. With the exception of the menorrhagias due to malignancies and incomplete abortion, Schmitz is of the opinion that the most important form of metrorrhagia is due to hemorrhagic metropathy or endometrial hyperplasia due to a persistent ovarian follicle. Miller[54] in a very interesting paper on the curettage of the uterus states that in a small group of well-selected cases curettage will cure intractible menorrhagia. Other cases with dysmenorrhea have also been relieved either by the preliminary dilatation or by the curette.

MALIGNANCY

It is no false humility to state that despite the amount of research that has been devoted to the study of cancer during late years, we are only at the beginning of a knowledge of its pathology. We have gained some information regarding the classification of tumors, the methods or mechanism of tumors, and the mechanisms of metastasis. Statistical studies have been materially widened. But in regard to the etiology, the most important factor of this great problem, the data we possess are painfully deficient.

Schmitz, Hueper, and Arnold[55] have made a careful comparative study of 61 cases of cervical carcinoma to ascertain whether the pathologist and clinician could deduce conclusions concerning the prognosis from their findings. These authors have tabulated their results based on a number of factors to which they have given values to determine a malignancy index. They have concluded that there is a definite relation of the cell type to this index. Plant[56] in a critical study of many hundred sections of carcinoma concludes that there is no reliable basis for a "histologic" prognosis in cervical carcinoma. The clinical classification of carcinoma of the cervix is still the best aid in making a prognosis. Pemberton,[57] in a study on the relation between the treatment of cancer of the cervix and of the cell type, concludes that the type of cell does not indicate whether operation or radium is the better treatment; that cases having more stroma than cancer tissue respond more favorably to either method of treatment than those with more cancer tissue than stroma. Culbertson in discussing this report states that we are not justified in giving a prognosis based on the cell type of uterine cancer. Ward and Keene are unable to attach any value to the predominating cell as a prognostic index.

Cordua[61] in a study of 40 cases of cancer of the cervix concludes that the prognosis is more favorable in the more differentiated form of carcinoma than in the less differentiated ones.

There are several instructive points about this relationship of prognosis to histologic findings, yet there is one important fact about which there can be no doubt, that is, that sections taken from different areas of the same tumor mass will give different histologic findings in reference to mitotic figures, degenerative areas, invasions, and blood supply. Bearing these facts in mind, it is clear that much may be said concerning morphologic grouping, yet regarding their true significance to prognosis, we must be comparatively brief.

A study on the question of relationship between the blood picture and prognosis of irradiated carcinoma of the uterus is reported by Hall.[60] The blood picture was examined before and again from eight to eleven days after irradiations. The cases with a favorable clinical course were followed with a relative and a small absolute increase in the lymphocytes. Unlike other investigators Hall was unable to find that an eosinophilia indicated a tendency towards cure, nor can one predict a recurrence from the blood picture.

During the past year many gynecologists have made a more extensive use of radium in the treatment of carcinoma of the cervix in preference to the radical surgical extirpation, and some of our leading authorities have abandoned surgery in the treatment of cervical cancer. The proper methods of treatment of this condition (surgery or radiotherapy) deserves more attention than can be given to it in a review of this type.

Hochman[62] reviews a series of 1,114 cases in which a supravaginal hysterectomy was performed in the Woman's Hospital of New York. Only three of the patients developed carcinoma in the stump, or 0.27 per cent. This excellent paper emphasizes that there is no necessity of routine panhysterectomy with its increased mortality. Isbruch[63] reports two cases of stump carcinoma after supravaginal hysterectomy and compares these with the 65 reported cases in the literature. He concludes that in spite of the possible factor of malignancy, the advantages of supravaginal operations should not be given up.

Koerner[64] reports a case of sarcoma in a stump of a supravaginal hysterectomy.

Kaufman[65] presents a statistical study of 2,000 cases of carcinoma of the pelvis with reference to age and living conditions. Before the war cancer incidence was highest between the ages of 50 and 55 years, while during the war it was highest between 46 and 50 years; and since the war it has been highest between the ages of 41 and 45 years.

Clark[66] and Norris obtained 56.5 per cent of three year cures of carcinoma of the fundus in which the symptoms had been noted for less than six months, and only 17.8 per cent in which the symptoms had been noted for over one year.

Farrar[67] urges the repair of the cervix due to trauma or infection as an important feature in the eradication of cancer. Five stages are recognized in carcinoma cases treated with radium: namely, the stage of hyperemia, slough, healing, contraction, and marked contraction. Holmes and Dresser[68] present an interesting account of the action of radium on different types of tissue. Fat is very resistant, nerve tissue is little affected even by heavy radiation, and intestinal mucosa is particularly susceptible.

There appears to be wide differences of opinion in regard to the periods of relief in inoperable carcinoma cases. Dalsgaard and Nielsen[69] report 12 per cent relief from all symptoms for periods up to three years and only 37 per cent showed no benefit. Hoed[70] reports cures in 6.5 per cent of inoperable cancer cases, and 66 per cent of the operable cases for three year periods . Such results are at variance in many radium clinics. Ransohoff[71] in a study of sixty cases of carcinoma concludes that radium offers results as favorable as those following operation. Phillips[72] reports similar results from the Berlin University Gynecologic Clinic. Döderlein and Voltz[73] sum up the experience in 2,300 cases of carcinoma and conclude that radiologic is superior to operative treatment as it is successful in curing even inoperable cases. Much caution should be exercised in evaluating these dogmatic conclusions.

Regaud,[74] Beuthrer, Recases, and Horsdihe state that, according to most reliable statistics, radium treatment effects a cure in from 15 to 20 per cent of cancer of the cervix regardless of the stage of development of the cancer. In inoperable carcinoma the incidence of cure is from 5 to 15 per cent, while in operable cases as a whole it is from 30 to 40 per cent, and in the most favorable group of cases it is from 40 to 60 per cent. Heimann,[75] in his studies on preoperative x-ray irradiation of carcinoma of the uterus, concludes that the deeper carcinoma cells are not affected by the treatment and that these viable cells can still proliferate and reduce the chances of success. Ward and Farrar[76] in a critical review and analysis of carcinoma of the cervix and body conclude that radium alone is preferable to surgery in all classes of carcinoma of the cervix.

Findley[77] in an excellent paper on precancerous lesions advocates vigorous education of the laity. He considers a lesion as precancerous when the epithelial cells are enlarged, irregular in size, with hyperchromatic nuclei and indistinct border outlines.

Bonney[78] performed the Wertheim-Ries operation for carcinoma in 214 of 340 unselected cases. He followed closely the technic of Ries in removing the cellular tissue occupying the obturator fossa as well as the glands lying along the veins, and practically all of the vaginal canal.

Thirty-four of the 214 patients died from operation, 82 died from recurrence, five died from other diseases, eight were lost sight of, and 85 were free from recurrence after five years.

The reader will probably note that the results of radiotherapy in this review have been given more space than the time honored surgical procedure. For we are of the opinion that operation is more sound and is the method of choice to be employed in properly selected cases. In spite of the inspired statistics of radium therapy and the ambitions of the roentgenologists, the death-rate remains without appreciable change.

STERILITY

Much caution should be exercised in the diagnosis of sterility, as more than one factor may be the cause of this condition. In a fairly large group of women there appears no obstruction of the fallopian tubes and yet they remain sterile.

Fogelson[79] in a well-planned series of experiments has attacked this problem on immunologic grounds. There was produced a temporary inhibition of fertility in his series of animals. Macomber[80] points out that the degree of fertility is indicative of the completeness and normality with which the reproductive organs are functioning, and that it is intimately bound up with conditions of general health. Sure[81] in an experimental study was able to produce sterility by deficiencies in diet.

Rubin[82] found that injections of collargol, thorium, bromide and iodide solutions produced peritoneal reactions in the patient. Inspissation persisted for some time in the tubal lumen when the tube was open, though in nonpatency no harm resulted. Stein and Arens[83] have combined pneumoperitoneum and the injection of opaque media for uterine and tubal diagnosis. No definite conclusions on this procedure are given by the authors on account of the comparatively few cases.

This is a very healthy and conservative attitude, as enthusiasm for the new is not infrequently permitted to obscure the merits of time honored and tried methods of diagnosis.

Beclére[84] emphasized the necessity of controlling the pressure when iodized oil is injected into the uterus. Pressures not exceeding 30 cm. of mercury produce no pain or complication. With a pressure of 40 cm. of mercury lipiodol may enter the blood vessels. Newell[85] gives a detailed description of the technic to be employed. Rongy[86] deplores the too frequent use of this procedure in the hands of the roentgenologist. There is no doubt that many patients suffer from sequelae as a result of insufflation made by mere technicians. Berri[87] noted that repeated tests with the Rubin method are necessary before we can claim a nonpatency of the tubes. It is not infrequent that a second or third test will reveal a tube patent which gave negative findings with the first test. Miles[88] suggests that Rubin tests be applied during abdominal operation and thus the patency of each tube can be accurately determined along its entire course. No description of the various technics and simplified methods of inflation[89-90] of the fallopian tubes will be given in this review.

Isbruch[91] sums up the results of operations of interpolar resection of the ovary and plastic operations of the tubes. Pregnancy ensued in 49.3 per cent of the 72 patients with primary sterility.

ECTOPIC PREGNANCY

The differential diagnosis of ectopic pregnancy from other acute abdominal affections presents one of the most difficult and important chapters in gynecology. Very few other acute conditions of the abdomen require the immediate attention of the gynecologic surgeon. It is for these reasons that every sound additional aid in the diagnosis of this condition is welcomed.

Danforth[92] calls attention to a referred pain in the shoulders in ruptured tubal pregnancy, particularly in those cases in which there is considerable intraabdominal hemorrhage. This is caused by the accumulation of escaped blood in the subphrenic space resulting in traction on the falciform ligament. A similar condition is frequently noted in patients after transtubal insufflation. Zeitlin[93] speaks of the value of exploratory puncture in the posterior vaginal wall, if not attempted in a state of shock. While it gives valuable information for the method of treatment to be employed, especially if pus or microorganisms are present, it should not be the sole basis for diagnosis. Kritzler-Kosch[94] emphasizes the value of a positive Hegar sign in intrauterine pregnancy as an aid in the differential diagnosis between extra- and intrauterine pregnancy. Repeated taking of leucocytic count, blood pressure, and hemoglobin percentage often reenforces a doubtful diagnosis of ectopic pregnancy.[95]

To add to the confusion of diagnosis a simultaneous intrauterine and ectopic pregnancy may be encountered. Novak[96] reports two cases of combined ectopic and intrauterine pregnancy with a summary of the 276 reported cases. An additional case of such combined pregnancy is reported by Sourasky.[97] A very interesting case of ovarian pregnancy associated with intrauterine pregnancy is described by Vineberg.[98] Cases of double ectopic pregnancies are recorded by Stuckey[99] and Clow.[100] Stallworth[101-102] reports a case of full-term intraligamentous pregnancy. Steckbauer[103] publishes an unusual ectopic pregnancy in an anomalous fallopian tube.

The fallopian tube with its normal tortuous course and especially after a previous infection, seemingly accounts for a large number of cases reported as diverticula of the tube. A careful systematic study of several hundred fallopian tubes should be undertaken to determine the frequency of diverticula. In most cases it appears that the diverticula seen in sections are due solely to the plane in which the specimen is sectioned.

However, McNalley[106] is of the opinion that diverticula play an important rôle in the etiology of ectopic pregnancy. Of the twelve cases studied by him he reports diverticula present in 10, or 83.3 per cent. Schoenholz[107] examined 32 pregnant tubes in which congenital diverticula were present in 15 cases.

Von Mikulicz-Radecki[108] from experimental investigations on tubal movements concludes that the ovum is transported by a rhythmic peristalsis, independent of any stimulus from the ovum. The author noted a definite change of rhythm in normal and pathologic tubes both in the longitudinal and circular muscular fibers.

Unterberger[109] reports a normal delivery after tubal implantation in one of his four cases. It is suggested that in patients in whom no portion of the tube is suitable for implantation, ovarian tissue should be implanted within the uterine cavity. Cotte and Bertrand[110] report three cases of implantation of the tube. Lipiodol injections showed the tube to be permeable but pregnancy has not occurred in any of the cases.

OVARY

It is difficult to evaluate properly the various researches on ovarian function. The fact remains that the complete chapter on the physiology of the female reproductive organs has not as yet been written.

It is impossible to make reference to the many papers on endocrine glands and evidences of interrelation with the ovary. The vastness of the work has been well expressed by Dr. Abel:[111] "Never before were there so many investigators, chemists, biologists, pathologists and clinicians engaged in one phase or another of this enormous subject. Already the usual output of special articles in this field numbers 3,000 per annum."

In the present state of our knowledge of hormones it is impossible to make definite statements as to the true meaning of ovarian (follicular) hormone. The peculiarity of these substances is that they are produced in one organ, and carried by the blood current to another organ, on which their effect is manifested. The fact that this ovarian hormone has been isolated from the placenta as well as from the umbilical cord raises considerable difficulty in the interpretation of a specific hormone.

Another very important fact to be borne in mind is the view advanced by Kantz, that it is impossible to obtain any such substance in the form in which it existed in the living cell. If this view be correct (and there is every reason to believe it to be true since living cells are in a continual progress, never actually arriving at an equilibrium), it would follow that the extracts of various cell constituents by chemical methods are not identical with those that exist in the living cell. Pratt, Allen, and Edgar[112] have made extensive experiments with the ovarian follicular hormone. A fact of considerable difficulty of interpretation was the failure to produce bleeding in a series of spayed monkeys or ovarectomized human females during the periods of injection of this hormone. This is at variance with the action of other known hormones as shown by the injection of secretin on the pancreas. Parker and Ballerby[113] report active, oestrous-producing substances from extracts of ovaries. Out of eight cases, the residual tissue had a greater activity than the corresponding liquor folliculi. Frank and Goldberger[114] report the presence of a female sex hormone in the circulating and menstrual blood of the human female. In a later paper[115] they state that it appears in the circulation from ten to fifteen days before the onset of menstruation in an amount increasing as the time of menstruation is approached, and that it then appears in the menstrual blood in considerable concentration, disappearing at the same time from the general circulation. This can be applied as a clinical test to determine the approximate time of ovulation, early pregnancy, and whether menorrhagia or metrorrhagia are due to an excess or deficiency of the ovarian hormone. Ralls, Jordon, and Doisy[116] have devised an improved method for the preparation of the hormone from hog liquor folliculi. This method yields a product virtually free from cholesterol whose potency is 25 to 40 rat units per milligram of solids. Laquer Hart and de Jough[117] observed an increased metabolism in castrated females after injections of ovarian hormone. Kylin[118] showed that extracts of liquor folliculi caused in every case a rise in blood sugar, extracts of corpus luteum a decrease in blood sugar. Zondek[119] determined that the content of woman's ripe follicle is 3 to 5 rat units, and he believes that the unit should correspond to the amount in the follicle instead of body weight. If the principle of weight were applied to hormones, the dose of pituitary extract in woman would be six hundred times larger than now employed. Doisy et al[120] conclude that the female sex hormone is taken up by the lymph and blood stream and selectively utilized only by Mueller's tract and the breasts. Hartman, Dupre and Allen[121] have shown that the sex hormone is not specific for species. They are of the opinion that this ovarian hormone consists of a definite compound, or at least a common organic radical, widely distributed in the animal series.

With regard to the ovarian hormone again it has to be noted that we possess only scattered data rather than a full knowledge, and we are not entitled to assume too many physiologic actions.

In a very picturesque description Hirsch[123] outlines many but little understood functions of the ovary modified by x-ray treatment. In one section of his paper there is a suggestion that radiation may result in the production of a hormone due to its effects on the interstitial cells or pelvic structures.

Elaborate assumptions are sometimes made to explain a theory but we are not entitled to accept them as definite statements in scientific medicine.

Shaw[124] in a study of the interstitial cells of the human ovary states that these cells are found with extreme difficulty with the usual hematoxyln stains. In his opinion the interstitial cells are formed from the theca interna of the corpus luteum and are present as early as the thirty-second week after intrauterine life.

Manheim[125] describes a rare tumor of the ovary, namely, a folliculoma ovarii malignum.

Delannoy and Breton[126] report a primary cylindrical epithelioma of the ovary derived from the Wolffian rests.

REFERENCES

(1) Jour. Am. Med. Assn., 1926, lxxxvi, 1437. (2) Ann. Surg., 1926, lxxxiii, 449. (3) Zentralbl. f. Gynäk., 1926, l, 129. (4) Zentralbl. f. Gynäk., 1926, l, 137. (5) Jour. Immunol., 1926, xii, 293. (6) Surg., Gynec. and Obst., 1926, xlii, 652. (7) AM. JOUR. OBST. AND GYNEC., 1926, xii, 217. (8) AM. JOUR. OBST. AND GYNEC., 1926, xii, 719. (9) Zentralbl. f. Gynäk., 1926, l, 947. (10) Nederl. Tijdschr. v. Geneesk., 1926, i, 626. (12) Jour. Am. Med. Assn., 1926, lxxxvi, 1745. (13) Surg., Gynec. and Obst., 1926, xlii, 600. (14) Proc. Roy. Soc. Med., 1926, xix, 74. (Sect. Obstr. and Gynaec.) (15) Zentralbl. f. Gynäk., 1926, l, 20. (16) AM. JOUR. OBST. AND GYNEC., 1926, xi, 105. (17) AM. JOUR. OBST. AND GYNEC., 1926, xi, 353. (19) Zentralbl. f. Gynäk., 1926, l, 644. (20) Jour. Infect. Dis., 1926, xxxviii, 333. (21) Jour. Am. Med. Assn., 1926, lxxxvii, 1377. (22) Surg., Gynec. and Obst., 1926, xlii, 482. (23) Surg., Gynec. and Obst., 1926, xlii, 837. (24) Southern Med. Jour., 1926, xix, 202. (25) Surg., Gynec. and Obst., 1926, xliii, 105. (26) Jour. Am. Med. Assn., 1926, lxxxvii, 1695. (27) Jour. Am. Med. Assn., 1926, lxxxvii, 1802. (28) Jour. Am. Med. Assn., 1926, lxxxvii, 1808. (29) AM. JOUR. OBST. AND GYNEC., 1926, xii, 374. (30) Jour. Am. Med. Assn., 1926, lxxxvi, 1763 (31) Jour. Am. Med. Assn., 1926, lxxxvii, 1926. (32) AM. JOUR. OBST. AND GYNEC., 1926, xi, 378. (33) AM. JOUR. OBST. AND GYNEC., 1926, xii, 665. (34) Jour. Am. Med. Assn., 1926, lxxxvii, 1859. (35) Surg., Gynec. and Obst., 1926, xliii, 282. (36) AM. JOUR. OBST. AND GYNEC., 1926, xi, 623. (37) Surg., Gynec. and Obst., 1926, xliii, 476. (38) Surg. Clin. N. Amer., 1926, vi, 79. (39) Jour. Am. Med. Assn., 1926, lxxxvii, 826. (40) Schweiz. med. Wchnschr., 1926, lvi, 121. (41) Am. Jour. Obst., 1926, xii, 89. (42) AM. JOUR. OBST. AND GYNEC., 1926, xii, 459. (43) AM. JOUR. OBST. AND GYNEC., 1926, xii, 484. (44) Internat. Abstr. Surg., Gynec. and Obst., April, 1927, pp. 299. (45) AM. JOUR. OBST. AND GYNEC., 1926, xii, 526. (46) AM. JOUR. OBST. AND GYNEC., 1926, xi, 112. (47) Jour. Am. Med. Assn., 1926, lxxxvi, 1105. (48) Brit. Med. Jour., 1926, ii, 723. (49) Jour. Obst. and Gynec. Brit. Emp., 1926, xxxiii, 380. (50) Monatschr. f. Kinderh., 1926, xxxi, 347. (51) Arch. f. Gynaek., 1926, cxxviii, 540. (52) Brit. Med. Jour., 1926, i, 472. (53) Northwest Med., 1926, xxv, 543. (54) AM. JOUR. OBST. AND GYNEC., 1926, xii, 860. (55) Am. Jour. Roentgenol., 1926, xvi, 30. (56) Surg., Gynec. and Obst., 1926, xliii, 450. (57) AM. JOUR. OBST. AND GYNEC., 1926, xii, 536. (55) Am. Jour. Roentgenol., 1926, xvi, 30. (56) Surg., Gynec. and Obst., 1926, xliii, 450. (57) AM. JOUR. OBST. AND GYNEC., 1926, xii, 536. (60) Arch. f. Gynäk., 1926, cxxvii, 708. (61) Brit. Jour. Radiology, 1926, xxxi, 477. (62) AM. JOUR. OBST. AND GYNEC., 1926, xi, 566. (63) Zentralbl. f. Gynaek., 1926, l, 1771. (64) Monatschr. f. Geburtsh. u. Gynaek., 1926, lxxiv, 76. (65) Zentralbl. f. Gynaek., 1926, l, 198. (66) Surg. Clin. N. Amer., 1926, vi, 118. (67) Surg., Gynec. and Obst., 1926, xliii, 719. (68) Northwest Med., 1926, xxv, 467. (69) Hospitalstid., 1926, lxix, 64. (70) Nederl. Tijdschr. v. Geneesk., 1926, ii, 1039. (71) Ohio State Med. Jour., 1926, xxii, 763. (72) München. med. Wchnschr., 1926, lxxiii, 272. (73) Acta Radiol., 1926, vi, 335. (74) Gynécologie, 1926, xxv, 218. (75) Zentralbl. f. Gynaek, 1926, l, 1945.

(76) Am. Jour. Obst. and Gynec., 1926, xi, 439. (77) Am. Jour. Obst. and Gynec., 1926, xi, 450. (78) Proc. Roy. Soc. Med., 1926, xx, 120. (79) Surg., Gynec. and Obst., 1926, xliii, 374. (80) New York State Med. Jour., 1926, xxvi, 179. (81) Jour. Biol. Chem., 1926, lxix, 29. (82) Am. Jour. Surg., 1926, i, 1. (83) Jour. Am. Med. Assn., 1926, lxxxvii, 1299. (84) Gynéc. et Obstét., 1926, xiv, 105. (85) Am. Jour. Obst. and Gynec., 1926, xii, 189. Am. Jour. Obst. and Gynec., 1926, xi, 616. (87) Semana méd., 1926, i, 657. (88) Surg., Gynec. and Obst., 1926, xliii, 97. (89) Deutsch. med. Wchnschr., 1926, lii, 1155. (90) Jour. Am. Med. Assn., 1926, lxxxvii, 409. (91) Zentralbl. f. Gynäk., 1926, l, 1705. (92) Am. Jour. Obst. and Gynec., 1926, xii, 883. (93) Monatschr. f. Geburtsh. und Gynäk., 1926, lxxii, 168. (94) Zentralbl. f. Gynäk., 1926, l, 2177. (95) Zentralbl. f. Gynäk., 1926, l, 1150. (96) Surg., Gynec. and Obst., 1926, xliii, 128. (97) Lancet, London, 1926, ii, 650. (98) Am. Jour. Obst. and Gynec., 1926, xii, 332. (99) Med. Jour. Australia, 1926, ii, 147. (100) Jour. Am. Med. Assn., 1926, lxxxvi, 1979. (101) Am. Jour. Obst. and Gynec., 1926, xi, 512. (102) Am. Jour. Obst. and Gynec., 1926, xi, 863. (103) Jour. Am. Med. Assn., 1926, lxxxvi, 621. (104) Am. Jour. Obst. and Gynec., 1926, xii, 253. (105) Am. Jour. Obst. and Gynec., 1926, xi, 305. (106) Am. Jour. Obst. and Gynec., 1926, xii, 303. (107) Arch. für Gynäk., 1926, cxxvii, 609. (108) Arch. für Gynäk., 1926, cxxviii, 318. (109) Monatschr. f. Geburtsh. u. Gynack., 1926, lxxiii, 1. (110) Lyon chir., 1926, xxiii, 660. (111) Bull. Johns Hopkins Hosp., 1926, xxxviii, 1. (112) Jour. Am. Med. Assn., 1926, lxxxvi, 1964. (113) Jour. Physiol., 1926, lxi, 562. (114) Jour. Am. Med. Assn., 1926, lxxxvi, 1686. (115) Jour. Am. Med. Assn., 1926, lxxxvii, 1719. (116) Jour. Biological Chemist, 1926, lxix, 277. (117) Deutsch. med. Wchnschr., 1926, lii, 1333. (118) Ztschr. f. d. ges. exper. Med., 1926, li, 599. (119) Klin. Wchnschr., 1926, v, 1218. (120) Endocrinology, 1926, x, 273. (121) Endocrinology, 1926, x, 291. (123) Surg., Gynec. and Obst., 1926, xliii, 659. (124) Jour. Obst. and Gynec. Brit. Emp., 1926, xxxiii, 183. (125) Arch. Path. and Lab. Med., 1926, i, 557. (126) Bull. Soc. d'obst. et de gynéc. de Paris, 1926, xv, 239.

Dr. J. Wesley Bovee, a member of the Advisory Editorial Board of this Journal since its founding, died in Washington, D. C., on September 3, 1927, after a lingering illness. A more complete obituary will appear in the October issue.

JOHN WESLEY BOVÉE
1861-1927

The American Journal of Obstetrics and Gynecology

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IN MEMORIAM

JOHN WESLEY BOVÉE

A Member of the Advisory Editorial Board of This Journal

Dr. John Wesley Bovée, a Fellow of the American Gynecological Society since 1897, died at the Columbia Hospital for Women in Washington, D. C., on September 4, 1927. He was born in Clayton, N. Y., in 1861, the son of William Henry and Sarah Elizabeth Bovée. His early education was received from private tutors and in the high schools of Dexter and Chaumont, N. Y. He graduated with the degree of M.D. in 1885 from Columbian University, now George Washington University, in Washington, D. C. He was Gynecologist to the Columbia Hospital from 1890 to the time of his death; to the Providence Hospital from 1891 to 1908; and to the George Washington Hospital from 1899 to 1927. For many years Dr. Bovée was Professor of Gynecology at George Washington University, resigning the position in 1926. An active member of the American Medical Association, he served as Chairman of its Section on Gynecology and Obstetrics in 1907. He was a member and past president of the Southern Surgical Society, a Fellow of the American College of Surgeons and one of its founders, a member and former president of the American Gynecological Society. Dr. Bovée was a prolific writer on subjects pertaining to his specialty and his contributions to medical literature numbered more than 200 papers. He edited and wrote several chapters in his most notable work, Bovée's *Practice of Gynecology.*

Dr. Bovée was essentially a self-made man. His native ability, industry, and ambition to excel finally made him an authority in gynecology and brought to him many well-deserved honors. He was especially fond of teaching, not only of undergraduate students, but also hospital interns and nurses, and spent many hours going over and correcting hospital histories and charts. He zealously guarded his rights as a physician and member of hospital medical boards. He had been twice married but left no family. Dr. Bovée was likewise a member of the American Gynecological Club and of the Cosmos and University Clubs of Washington.

By his death the American Gynecological Society loses one of its oldest and most useful members and our country a citizen of note, who was ever ready to sacrifice his leisure and convenience to serve his country, his profession, and his fellowmen.

G. Brown Miller.

President's Address

THE SPIRIT OF SERVICE

By Arthur H. Curtis, M.D., Chicago, Ill.

Presidential Address at the Fifty-second Annual Meeting of the American Gynecological Society Held in Hot Springs, Va., May 23-25, 1927

THE subject of these brief remarks may be somewhat too delicate for one not gifted in the art of discourse. If so, I beg of all of you a kind indulgence and will proceed at once with what I have to offer.

Others, in former years, have presented surveys of the work produced by this Society. At the most, reiteration of the salient features of some of those presidential addresses is all that you will care for at this time.

Our keen-minded, truth-loving Whitridge Williams pictured, most strikingly, the part which we had played in the advancement of obstetrics; in summary, a truly insignificant and wholly unworthy list of papers, emanating from a group of men supposed to be the leaders in this field.

In contrast, the following year, after most painstaking and thorough study, Dr. Watkins revealed to us a large group of valuable contributions in the field of gynecology. Many of these were epochmaking papers which will continue to have intrinsic worth long after we are gone.

It remained for Dr. Chipman, of Montreal, to complete the survey; to make us proud of our past, yet aware of our faults, and to inspire us with ambition for future progress. Surely no one who heard that address could fail to become imbued with more lofty ideals and a purer spirit of love for his confrères and sympathy for suffering womankind.

Turning to the present, it may be well to note wherein we should do better. One of our Fellows recently deplored the lack of younger members, the limited number who attend our meetings, and the notable absence of the spirited debate and controversy which should mark these gatherings. He is convinced that every one who differs with the author of a paper should enter the discussion; that silence means agreement, and that nowadays there tends to appear in our transactions much that creates a wrong impression because undue politeness and overzealous courtesy inhibit refutation of erroneous views. As another expressed it: "We have too much back-slapping and back-scratching—too much golf and other play at meetings; there is a lack of scientific work and a want of intelligent discussion because our members fail to study and produce."

I most warmly favor, in this Society, the maintenance of a small group, selected chiefly for achievement and ability. Small membership fosters freedom of discussion and more intimate personal contact, so helpful to us all. From every annual meeting I return to duties at home, warmed by increasing friendship for those whom I have seen once more, keenly ambitious to do better work, inspired with higher ideals and imbued with a desire to be of utmost service to my patients and to the younger generation who look to us for guidance.

Does spirited debate and argument achieve so much? If so, then why, in consultation, where we give our best, do we not argue heatedly, rather than decide by sympathetic interchange of views and careful logic, the plan best suited in the management of those intrusted to our care? Likewise, in the laboratory, where growth of thought and interchange of views are at their highest level, is not our progress greatest when the talk is least and arguments are few?

Adequate discussions are vital. Differences of opinion should be freely aired. But I have always held that one should feel a mission when he rises to his feet; at least that he should be impelled to speak because there still remains something of special import left unsaid.

Just as we find that many roads lead to Rome, so each one has his way. Some men talk often and say much. Others are silent, and, for most of us, silence is golden. It is not requisite that we refute false views; they die a natural death and suffer less from agony if spared the useless stimulation of protracted argument.

One person among us illustrates some points that I would make. Almost unrivalled in creative work in all the history of our specialty, he stands out even more preeminent as one whose greatest interest centers solely in a search for truth. He is above all thought of controversy and listens earnestly, attentively, without retort, to every contrary view expressed. Discussion means to him a sacred consultation, not an altercation, a conference of trained minds in a conjoined effort to disclose new facts which lead to progress. We honor him for his work, we admire him for his modesty and gentle spirit, and we think not a bit less of him because he sits in Sphinx-like silence throughout the greater portion of our meetings.

All told, we make some progress. And, speaking as your former secretary, I wish to express publicly my admiration for the high-minded cooperation and spirit of service so generally in evidence among our members. This Society is, seemingly, now at its best in helpfulness to the profession at large and in productive scientific work.

Also, let us not be too oblivious of the service rendered by our individual Fellows in their tasks at home. In New York City, at the Woman's Hospital, there has grown up an institution so well organized that it is now without a peer in excellence of management. In systematic after-care of patients, in conference among the members of its staff, in accuracy of records and statistics, it is a model of which we may well be proud.

We number also, here, a leader in the fight for control of cancer; likewise, one who has done more than any other man to elevate the standards of our hospitals; also, the authors of our best known standard textbooks, and the founders and editors of journals recognized as excellent throughout the world of medicine.

Then, too, we have a larger group; these are thoughtful teachers of young men, leaders, almost without exception, in our greatest schools. Vitally interested in their work at home, mindful of the welfare of their patients, their service will be long remembered and their influence felt throughout the years to come. And so we might go on, with more than kindly words about all gathered here. But time is short, and my aim should not be to discourse to the end about all of your virtues.

Now let us turn, for a brief space, to thoughts of those whose seats are vacant. As we look back upon quite recent days spent with our former Fellows, now deceased, no conference is required to help decide wherein they rendered service. The influence of their personal lives is ever with us, a permanent and constant heritage; a gift more rare, to me, than all their scientific work. Extended backward to us, from the life beyond, we feel their guiding hands put forth to lead us.

In my own case, I sense, with special force, the helpfulness of a most modest, truth-inviting man. Each day he leads me on, through impress of the life he lived. Despite a generous group of scientific contributions, to me he left much more in demonstration of a humble spirit, in his most patient care to risk no life in needless surgery, in precept that to cheer with helpful word and kindly smile is of the utmost value. We need these lessons in the art of kindliness; throughout our busy lives we should all nurse our sympathy for those who suffer; we need, also, to learn to be more generous to our young colleagues, just as this man was, in countless ways, without a vestige of that common fear that some day they might grow to be competitors.

This word of retrospect stirs up fond memories of others gone, and from their lives we learn a better regulation and adjustment of our own. We learn the fruitlessness of uncurbed personal ambition, of false desire for unearned praise and glory, of the too great price which money sometimes costs, of heartaches caused by selfishness where kindness should be found.

A final thought, in closing. It is a custom of our race to be forever striving,—in this country striving to our utmost. I wonder whether we have not engulfed ourselves in an American treadmill habit of continual and untiring effort to the exclusion of all else that makes for happiness? The public utterances of those in medicine whom we respect center about the need for *progress,* about *work* poorly done or left undone, about our misdirected energies, and how we might accomplish more. This *urge to do* applies with added force to those who practice in our specialty, and in our double-specialty perhaps the most of all. What is it all about? In serving, sacrifice comes first, but let us also serve our families and ourselves. More respite from unceasing toil should be the share of each and all of us. Otherwise the truly perfect spirit of service will never be fulfilled.

Original Communications*

PERITONEAL ENDOMETRIOSIS DUE TO THE MENSTRUAL DISSEMINATION OF ENDOMETRIAL TISSUE INTO THE PERITONEAL CAVITY

By John A. Sampson, M.D., Albany, N. Y.

(From the Gynecologic and Pathologic Departments of the Albany Hospital and the Albany Medical College)

At the meeting of the American Gynecological Society in 1921, the writer presented a paper[1] on perforating hemorrhagic cysts of the ovary and their relation to pelvic adenomas of endometrial type. Twenty-three of these cysts were reported at that time. In fourteen of them, a histologic study had been made of the peritoneal lesions, apparently resulting from the escape of the contents of the cysts into the peritoneal cavity. Endometrial tissue was found in thirteen. I concluded that the hemorrhagic ovarian cysts, associated with the peritoneal lesions containing endometrial tissue, were endometrial cysts filled with menstrual blood and that the peritoneal endometriosis arose from the escape of the cyst contents into the pelvis and the resulting peritoneal reaction. In view of the theories which have arisen to explain the origin of the peritoneal endometriosis associated with these cysts, the following quotation from that paper may be of interest.

> The question naturally arises: in what way do the contents of the cyst or ovary cause the development of these adenomas? Is it due to some specific irritant present in the cyst contents which stimulates the peritoneal endothelium to a metaplasia with the development of endometrial tissue typical both in structure and function? Some may assert that dormant endometrial epithelium may be present in the tissues soiled by the contents of the cyst and this is stimulated to further growth. It seems to me that the conditions found in many of these specimens are analogous to the implantation of ovarian papilloma or cancer on the peritoneal surfaces of the pelvis from the rupture of an ovarian tumor containing these growths.

At that time I believed that the ovary was the principal, if not the only, source of the peritoneal implantations which arose from endometrial tissue disseminated by the menstrual perforation of an endometrial cyst or by the menstrual reaction of endometrial tissue on the surface of that organ. Up to that time only a few peritoneal lesions had been observed by me without demonstrable endometrial tissue in the ovary. An attempt was made to explain these on the basis that they had arisen from the implantations of endometrial tissue, derived from small

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*The current issue of the Journal is devoted to the first part of the Transactions of the Fifty-second Annual Meeting of the American Gynecological Society, held at Hot Springs, Va., May 23, 24, 25, 1927. The discussions on the papers presented will be incorporated in part in the next issue of the Journal.

Note: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

endometrial foci in the ovary, and that the latter had either been destroyed by menstrual reactions or else were so small that they had been overlooked.

Later studies convinced me that peritoneal endometriosis frequently occurred without endometrial tissue in the ovaries, and some other way by which this tissue might reach the peritoneal cavity was sought. Blood was observed escaping through the abdominal ostia of the tubes of patients operated upon during menstruation. Bits of endometrial tissue were found in the lumina of some of these tubes. The frequent close anatomic relation between the distribution of the peritoneal lesions and the fimbriated ends of the tubes was observed at operation. It was found that the tubes were usually patent in patients with peritoneal endometriosis. All these data, together with the indication that, at times, endometrial tissue escaped into the peritoneal cavity from other sources than menstruating tissue in the ovary, pointed to the backflow of menstrual blood from the uterine cavity through the tubes as one of these sources and also to epithelium escaping from the tubal mucosa as another. The purpose of this paper is to present the evidence indicat-

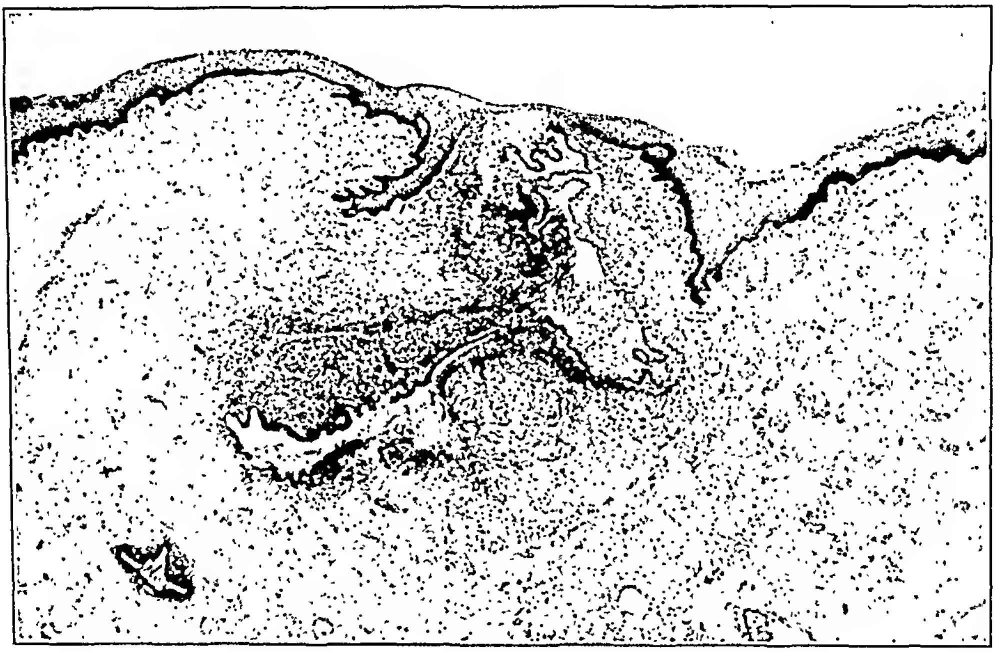


Fig. 1.—Photomicrograph (x 25) of a portion of the posterior vaginal wall with a submucous endometrial cavity about to rupture into the vagina (Case 4 of previous article[2]). The patient had peritoneal endometriosis fusing the anterior surface of the uterus with the bladder, and a similar lesion obliterating the bottom of the posterior culdesac with invasion of the rectosigmoid and the posterior vaginal wall. The cavity contains blood and bits of endometrial tissue; operation on the second day of menstruation. The vaginal mucosa over the cavity is very thin and had the operation been deferred subsequent menstruations of the endometrial tissue lining this cavity undoubtedly would lead to a rupture through the attenuated vaginal mucosa with the discharge of the menstrual contents of the cavity into the vagina. The actual rupture of two similar cavities of the vaginal wall into veins was observed in this case and embolic implantations of endometrial tissue in near-by vessels was found (Figs. 58, 59, 60, 61 and 66 of previous article[2]). It is conceivable that similar endometrial cavities situated in the ovary or in any other pelvic structure, whose endometrial lining reacted to menstruation, might rupture and discharge their contents into the peritoneal cavity and also that implantations of endometrial tissue might occur on the peritoneum just as they occurred in the veins of this patient.

ing the origin of peritoneal endometriosis from the implantation of endometrial tissue disseminated by menstruation. Its origin from other sources will be considered in a later article.

If it is true that peritoneal endometriosis arises from the implantation of endometrial tissue carried by menstrual blood escaping from endometrial foci in the ovary and also from the uterine cavity through the tubes, the following three suggestions or theories present themselves.

1. Peritoneal endometriosis might be caused by menstrual blood escaping from endometrial tissue on or in other pelvic organs and structures than the ovary.

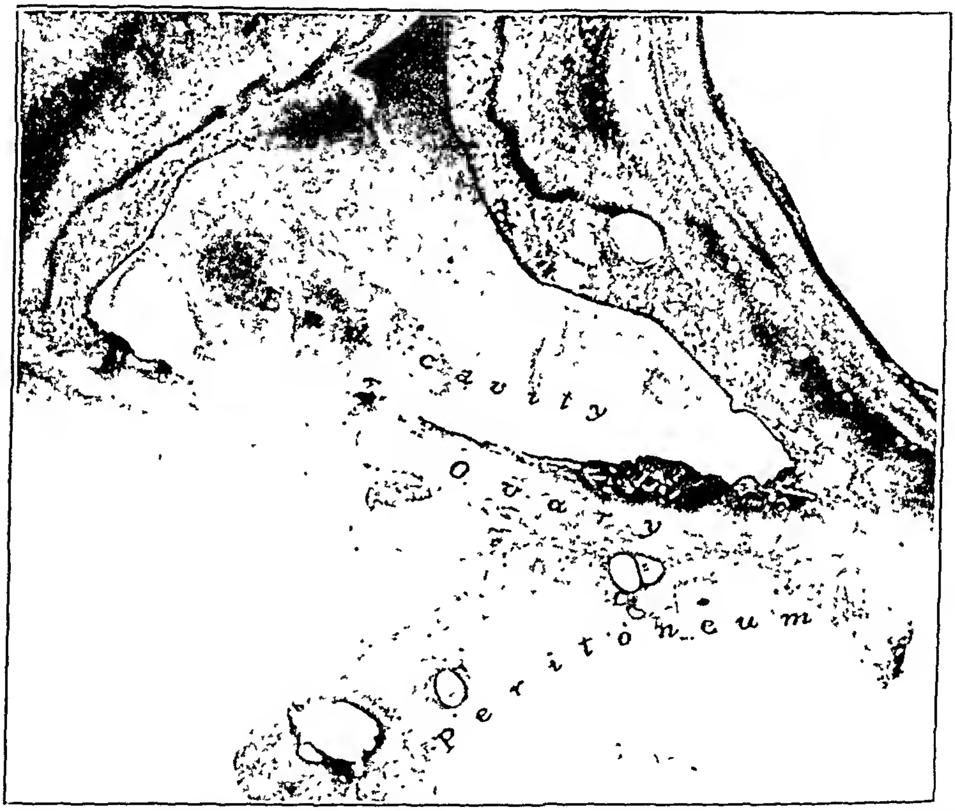


Fig. 2.—Photomicrograph (x 10) of a portion of the ovary adherent to the posterior layer of the broad ligament. Uterus, right tube, and ovary removed for a large leiomyoma on the second day of menstruation (Case 1 of previous article[2]). The ovary was firmly adherent by its *lateral surface* to the posterior layer of the broad ligament. Peritoneal endometriosis was present in the structures about the ovary and in the posterior culdesac. The right tube and ovary, together with the portion of the peritoneum attached to the latter, were carefully removed and placed in formalin before attempting to remove the *uterus*. A typical endometrial cyst or cavity, filled with blood, is shown and also endometrial lesions in the peritoneum adherent to the surface of the ovary. The endometrial tissue lining the cyst and that in the peritoneum must have had a common origin or one was secondary to the other. Could the peritoneal endometriosis possibly have arisen from the escape of the contents of the endometrial cyst into the pelvis?

2. Endometrial tissue in the ovary might arise from the implantation of bits of that tissue carried by menstrual blood escaping through the tubes and also from endometrial foci on other pelvic organs or structures.

3. The peritoneal endometriosis, so often associated with endometrial tissue in the ovaries and apparently secondary to the latter, at times, might have arisen from some other source.

I greatly appreciate the interest shown by others in those observations and theories and relish most of all their objections and criticisms. The latter are stimulating and will make for a better understanding of the entire subject. I fully realize that the implantation theory does not account for all instances of ectopic endometrium-like tissue in the pelvis and that menstruation is only one means of disseminating that tissue. I value the opinion of those who believe in the differentiation of celomic epithelium as a source of endometrial tissue in the ovary and peritoneum. In spite of the increasing acceptance of the serosal or celomic epithelial origin of peritoneal endometriosis, I believe that bits of endometrial tissue, carried by menstrual blood escaping into the peritoneal cavity, at times, become implanted on the peritoneum and thereby constitute one source of peritoneal endometriosis, just as the implantation of cancer cells on the peritoneum constitutes one cause of peritoneal carcinosis. I believe that menstrual blood escapes into the peritoneal cavity from the following sources:

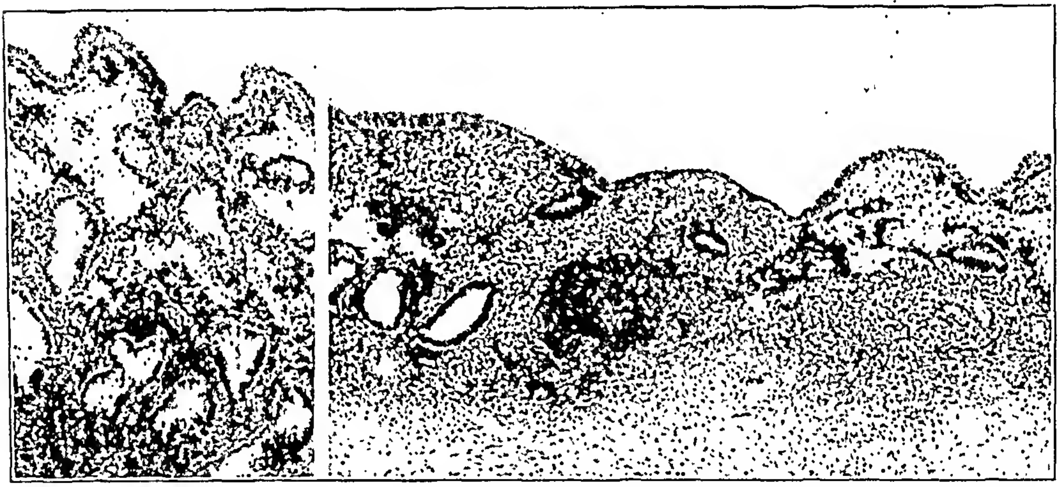


Fig. 3.—Two photomicrographs (x C0), the first of a portion of the menstruating mucosa lining the uterine cavity and the second of the endometrial lining of the cyst shown in Fig. 2. Both show the same reaction to menstruation.

1. The menstrual rupture or perforation of the wall of an endometrial cavity (cyst), most frequently seen in the ovary.

2. The menstrual reaction of endometrial tissue, growing on the peritoneal surface of the ovary or any other pelvic organ or structure.

3. A backflow, through the tubes, from the uterine cavity and also from the menstrual reaction of the tubal mucosa.

All phases of this theory, as to the implantation on the peritoneum of endometrial and tubal tissue disseminated by menstruation, must be considered seriously, if each of the following statements can be shown to be true or even possibly true.

1. Whenever endometrial tissue reacts to menstruation this reaction is the same whether in that lining the uterine cavity or situated at a dis-

tance from it, and, at times, bits of this tissue are set free in menstrual blood and may be carried (disseminated) by the latter from these foci.

2. Endometrial tissue, disseminated by menstruation, is sometimes alive and will continue to grow, if transferred to situations suited to its growth.

3. The peritoneum is suited to the growth of endometrial tissue.

4. Menstrual blood, carrying with it bits of endometrial tissue, at times, escapes from ectopic endometrial foci into the peritoneal cavity.

5. Occasionally menstrual blood escapes from the uterine cavity into the tubes. Bits of endometrial tissue have been found in blood in the lumina of the tubes of menstruating uteri. Sometimes the lumen of the interstitial portion of the tube is of sufficient size to permit bits of endometrial tissue to pass through it.

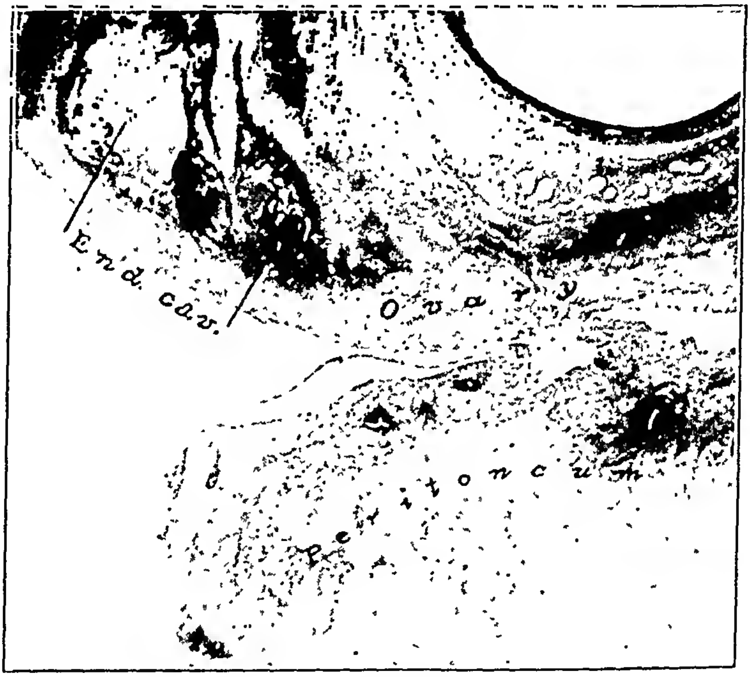


Fig. 4.—Photomicrograph (x 10) of a portion of the ovary and adherent peritoneum shown in Fig. 2 at another level. The endometrial cyst or cavity of the ovary contains blood with bits of endometrial tissue set free by the menstrual reaction of its lining, just as they are set free in menstrual blood arising from the mucosa lining the uterine cavity (see next illustration). Should such a cyst rupture during menstruation, its contents (blood and endometrial tissue) would escape into the peritoneal cavity and might cause adhesions. What would be the possible origin of any endometrial tissue in structures adherent to the ovary, such as the peritoneum shown in this illustration?

6. The lesions of peritoneal endometriosis often occur in situations and under conditions indicating their origin from the above mentioned sources.

7. The local reaction of the peritoneum to the endometrial tissue in peritoneal endometriosis is similar to the local reaction of the peritoneum to the cancer in peritoneal carcinosis of implantation origin.

THE MENSTRUAL DISSEMINATION OF ENDOMETRIAL TISSUE

The histologic study of uteri, removed during the various stages of the menstrual cycle and in which the veins have been injected, demonstrates the mechanism by which endometrial tissue may be disseminated from that organ (See previous article).[2] The uterine mucosa contains venous capillaries which sometimes are dilated to form sinuses. These sinuses empty into similar sinuses (endothelial lined spaces without definite walls) of the myometrium and the latter empty into the arcuate veins which convey the venous blood from the uterine tissue into the venous circulation outside of that organ. During menstruation the venous capillaries of the mucosa rupture and blood escapes into the surrounding tissue and bits of the latter are set free in the extravasated blood. This blood breaks through the surface epithelium of the mucosa into the uterine cavity, often carrying with it bits of endometrial tissue suspended in that blood. These studies suggest that extravasated menstrual blood in the uterine mucosa, at times, might escape back into the lumen of the ruptured capillaries and sinuses from which it came and carry with it (disseminate) endometrial tissue into the venous circulation of the uterus. This actually occurs as has been shown.[2]

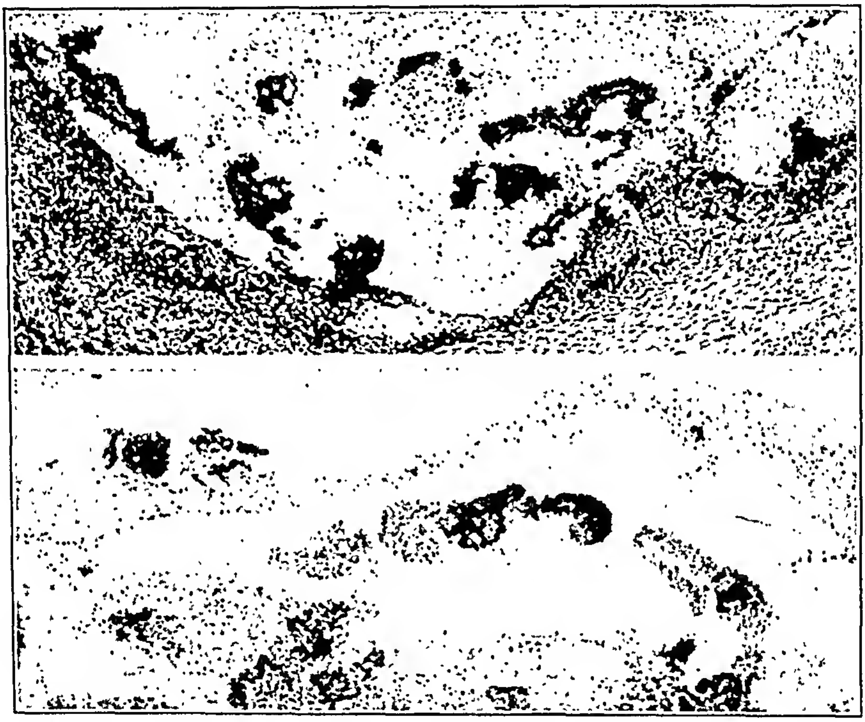


Fig. 5.—Two photomicrographs (x 60), the upper one of the menstrual contents of the endometrial cavity of the ovary shown in Fig. 4 and the other of the uterine cavity. They are much alike. Blood and fragments of endometrial tissue are present in both, histologically in a fair state of preservation and possibly as capable of living, if transferred to a suitable situation, as endometrial emboli disseminated into veins during menstruation.

The histologic study of the endometrial tissue of a direct or primary endometriosis (so-called adenomyoma arising from the direct invasion of the uterine wall by the mucosa lining its cavity) shows that this tissue contains venous capillaries (Fig. 12 of previous article[2]) similar to those of the mucosa lining the uterine cavity and that the reaction to menstruation of this misplaced endometrial tissue is similar to that of the former, except that it is not as constant or as general as that of the uterine mucosa. The endometrial tissue of a direct endometriosis, in its invasion of the myometrium often penetrates the spaces occupied by the vessels and sinuses of the uterine wall but is separated from the lumina of the latter by their endothelial lining. This has been emphasized by Robert Meyer[3] and Kitai in their descriptions of the relation of misplaced endometrial tissue to the lymphatics of the uterine wall. The study of specimens, in which the veins have been injected, has convinced me that the majority of the vessels of the uterine wall, which previously I had considered to be lymphatics, are venous sinuses. It might be as-

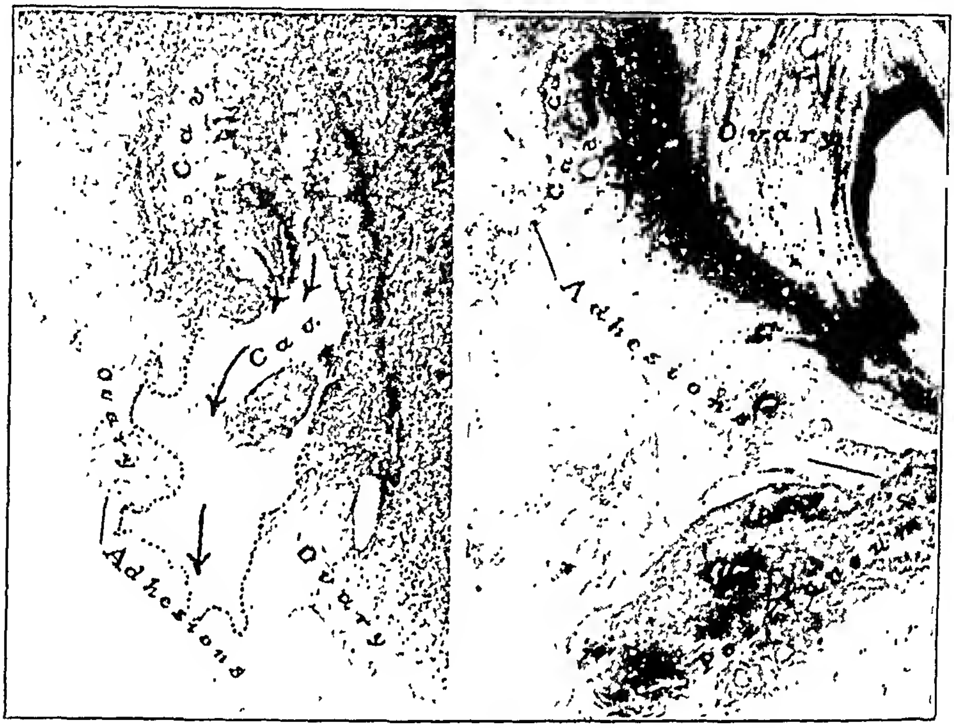


Fig. 6.—Two photomicrographs (x 25 and 10) of a portion of the right ovary and adherent peritoneum shown in the preceding illustrations, at another level. The endometrial cavity of the ovary appears much smaller and nearer the surface of the ovary. It is similar to the endometrial cavity of the vaginal wall shown in Fig. 1. Both patients were operated upon the second day of menstruation and both endometrial cavities contained blood and bits of endometrial tissue. The endometrial cavity of the vaginal wall was about to rupture and discharge its menstrual contents into the vagina. The endometrial cavity of the ovary had possibly ruptured into the peritoneal cavity at a previous menstruation and was closed by newly-formed connective tissue (adhesions) growing over it, as shown by the fibroblastic character of the adhesions covering the ragged rent in the wall of the cavity. The "rent" in the wall of the cavity and the inner surface of the adhesions covering it have been accentuated by dotted lines. These adhesions (see second photomicrograph) are continuous with similar adhesions uniting the lateral surface of the ovary to the posterior layer of the broad ligament. We have evidence that the adhesions uniting the ovary to the peritoneum might have arisen from the escape of the menstrual contents of the endometrial cavity of the ovary and that bits of endometrial tissue are often present in menstrual blood. Endometrial tissue is "embedded" in the peritoneum adherent to the ovary. Could there be any relation between the endometrial tissue escaping from the cavity of the ovary and that "embedded" in the peritoneum adherent to it?

sumed that in the menstrual reaction of this misplaced endometrial tissue, bits of it might escape into its own venous capillaries and even into the lumen of a sinus of the uterine wall along which the endometrial tissue sometimes grows in an extra- or retroendothelial course. I have

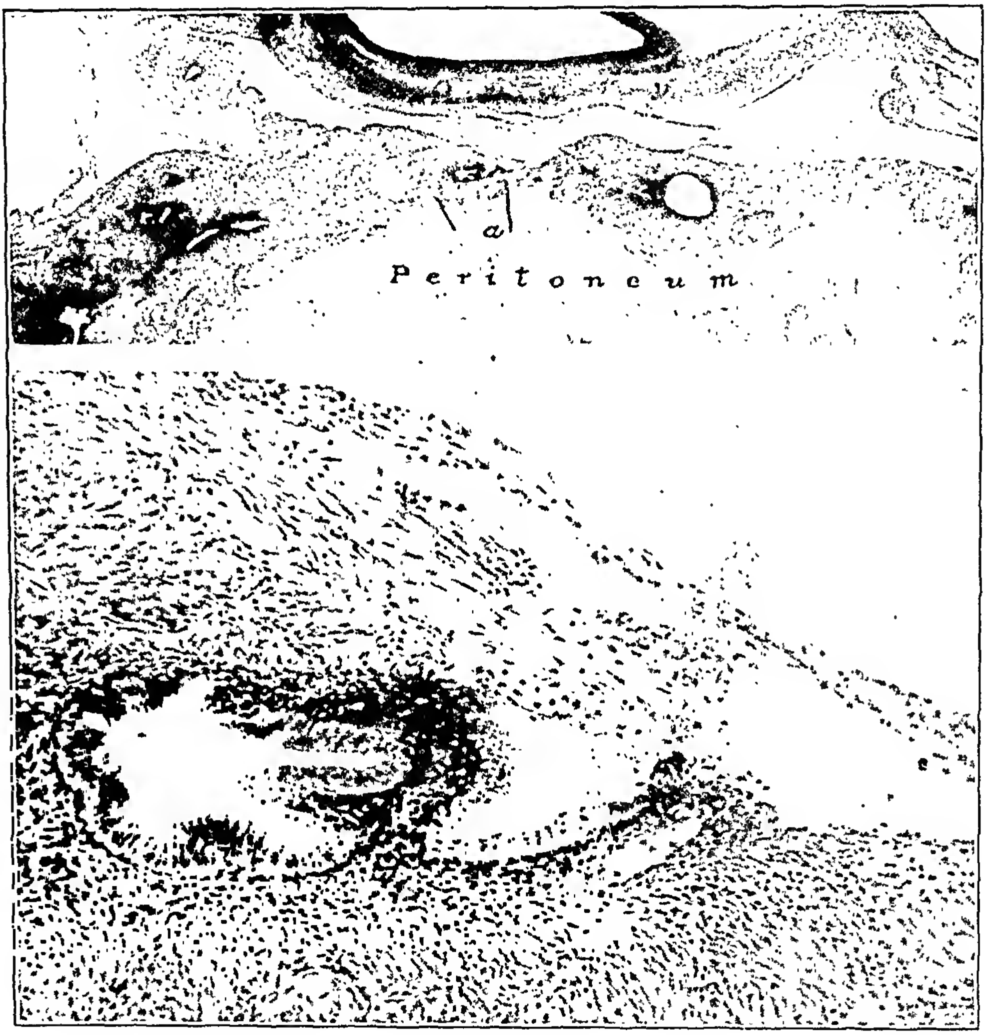


Fig. 7.—Two photomicrographs, the first (x 10) of a portion of the posterior layer of the broad ligament adherent to the lateral surface of the ovary. The adhesions indicate that there had been a reaction to some irritant escaping into the peritoneal cavity. Fig. 6 indicates that blood might have escaped into the peritoneal cavity from the menstrual reaction of endometrial tissue in the ovary. A peritoneal endometriosis is present and if it were caused by the escape of menstrual blood from the ovary, the endometrial tissue of the endometriosis must have arisen, either from a metaplasia of the peritoneal mesothelium due to some specific stimulant in menstrual blood and not found in other well-known peritoneal irritants, or else from the actual implantation of bits of endometrial tissue often present in menstrual blood. There is a hyperplasia of the peritoneum about the endometrial foci. For a higher magnification of the endometrial "deposit" indicated by *a*, see the next photomicrograph.

The second photomicrograph (x 130) is of the endometrial lesion indicated by *a* of the preceding illustration. The tissues of the peritoneum are growing over (embedding) the endometrial tissue. The fibroblastic character of the peritoneum covering the endometrial tissue shows that it is of recent origin and histologically it is the same as that of the adhesions covering the rent in the wall of the ovarian endometrial cavity (Fig. 6). This suggests that possibly they are of the same age. The reaction of the peritoneum to the endometrial tissue in this instance is similar to that sometimes found in peritoneal carcinosis of implantation origin. I believe that we are justified in stating that peritoneal endometriosis, at times, arises from the implantation of endometrial tissue carried by menstrual blood escaping from endometrial foci in the ovary, and probably did in this instance. If so, some of the endometrial tissue, set free by menstruation, must have been alive.

not definitely demonstrated this in a careful study of many sections from many blocks of tissues from uteri with a direct endometriosis which were removed during menstruation, but I believe that either it has been seen by others or will be found. The same applies to misplaced endometrial tissue of other origin than a direct invasion of the uterine wall by its mucosa. In one instance of endometriosis of the culdesac, presenting in the posterior vaginal vault (a so-called adenomyoma of the rectovaginal septum) the actual escape of the menstrual contents of two ectopic endometrial cavities into adjacent veins was found. As a result of this observation I believe that a similar condition occasionally may arise in any situation, where endometrial tissue reacts to menstruation.

Since bits of the uterine mucosa, at times, escape into the venous circulation of the uterus during menstruation, certain questions arise. What is its pathologic and clinical significance? Could it possibly give rise to metastatic or embolic endometrial lesions not only in the uterine wall but also outside of that organ?

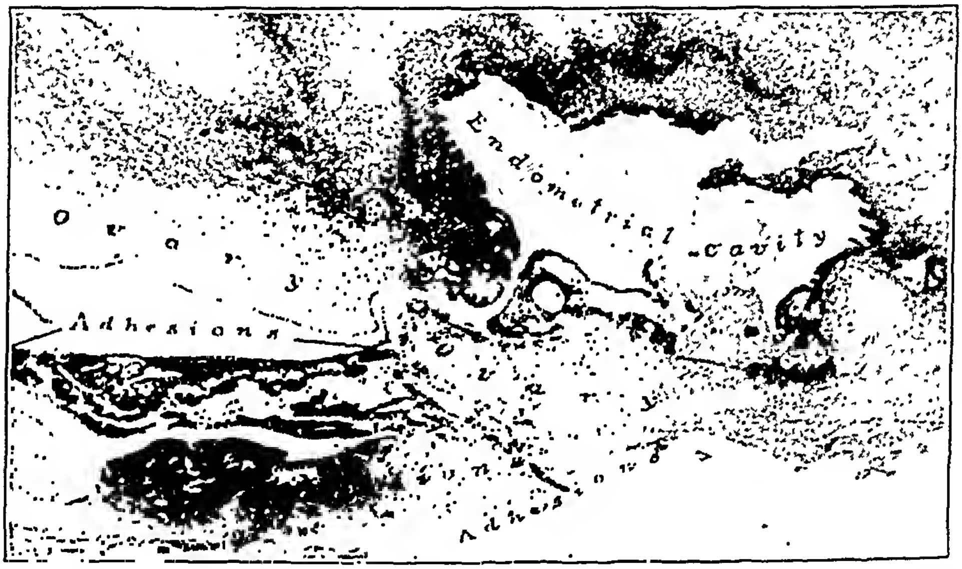


Fig. 8.—Photomicrograph (x 20) of the opposite end of the endometrial cavity shown in Fig 6. Endometrial tissue is enmeshed in adhesions on the surface of the ovary. Many sections were studied from this portion of the "block" and positive evidence of a perforation of the wall of the cavity was *not* found in this situation. If endometrial tissue had escaped from or had invaded the ovary at this place, the repair has been so complete that the portal of exit or entrance has been effaced.

EVIDENCE OF THE VIABILITY OF ENDOMETRIAL TISSUE DISSEMINATED BY MENSTRUATION

If endometrial tissue disseminated by menstruation is "*thrown off to die*" and is either actually "dead or dying," as has been so emphatically stated by Novak,[4] that phase of the implantation theory is likewise just as dead. If endometrial tissue disseminated by menstruation is sometimes alive and capable of growing, *if* transferred to suitable situations, we might expect to find embolic lesions of this tissue in the vessels of the uterine wall and even outside of that organ. If these lesions were found, they would furnish very strong evidence that they might have arisen from the implantation of endometrial emboli cast off by menstruation into the venous circulation.

I have recently reported[2] two such cases. Both patients were operated upon during their menstrual period. Bits of endometrial tissue were found in the venous sinuses of both uteri. An embolic or metastatic growth of endometrial tissue was found in a venous sinus of one uterus and many such lesions in the other uterus. Sufficiently complete serial sections showed that these growths either arose from or were implanted on the walls or linings of these vessels and did not arise from the invasion of the latter by endometrial tissue from without. These embolic-like growths of endometrial tissue must have originated either from a localized metaplasia of the endothelial lining of the veins and venous sinuses or else from the actual anchoring and implantation of bits of endometrial tissue similar to those found floating about in some of the vessels of the uterus. While an endometriosis of the direct type was present in a portion of the wall of each uterus, the distribution of the embolic lesions, as well as other histologic findings, indicated that the endometrial emboli, primarily responsible for the metastatic lesions, probably came from the mucosa lining the uterine cavity. Even if these emboli had been derived from the endometrial tissue of a direct endometriosis of the uterine wall, some traumatism would be necessary to rupture the endothelial lining of its veins and disseminate bits of endometrial tissue into their lumina. The reaction to menstruation is the most evident cause of such an injury.

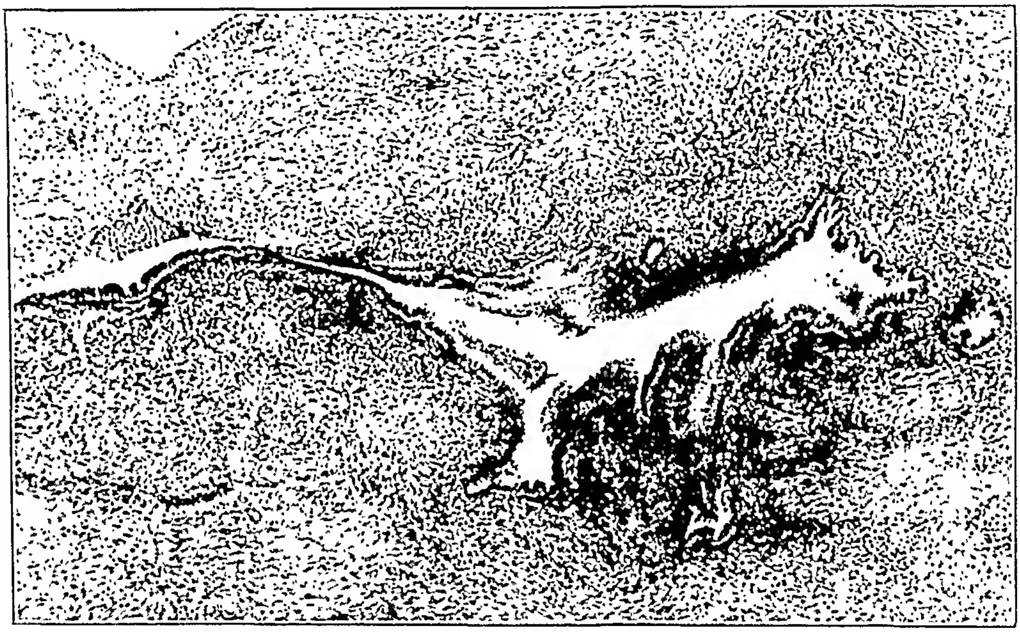


Fig. 9.—Photomicrograph (x 60) of an endometrial cavity of the posterior layer of the broad ligament adherent to the ovary. Blood is present in this cavity, and portions of its endometrial lining show the same reaction to menstruation (but not as marked) as that found in the mucosa lining the uterine cavity and the cyst of the ovary (Fig. 5).

Could bits of endometrial tissue escape into the venous circulation from the mucosa lining the uterine cavity by any other means than as a result of a menstrual reaction? We look to two other possible causes of this phenomenon, curettage and the termination of pregnancy by abortion or labor. Neither of the two patients, mentioned above, had ever been curetted and only one had been pregnant and that fourteen years before her operation.

Many interesting endometrial lesions were present in an endometriosis of the posterior vaginal wall of the second case. An endometrial cavity filled with menstrual blood and containing bits of endometrial tissue had almost eroded the overlying vaginal mucosa and was about to rupture and discharge its menstrual contents into the vagina (Fig. 1). From the study of this lesion, one could readily understand how a similar endometrial cavity in the ovary or any other pelvic structure might rupture and disseminate its menstrual contents into the peritoneal cavity. We could also understand that a similar endometrial lesion might rupture into an adjoining lymph vessel or capillary during its reaction to menstruation. The operation occurred on the second day of the men-

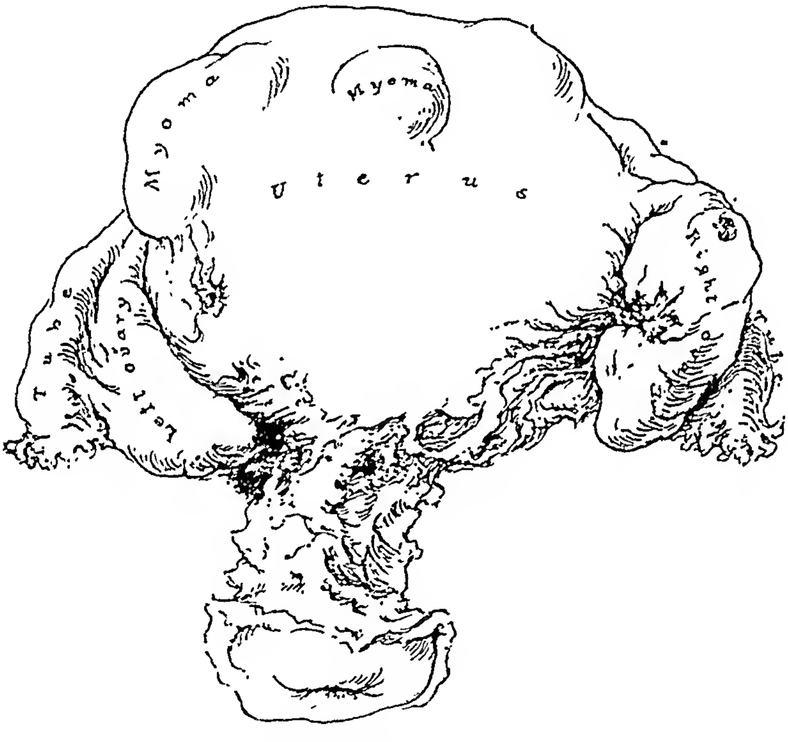


Fig. 10.—Posterior view of the uterus, tubes and ovaries (x ⅔) removed for an extensive peritoneal endometriosis, fusing the posterior surface of the cervix with the sigmoid, thus obliterating the bottom of the culdesac. The uterus contains multiple leiomyomas; both tubes were *patent*. The right ovary is adherent by its *under surface* to the posterior surface of the uterus and the broad ligament of that side. The left ovary is adherent by its *lateral surface* to the posterior layer of the broad ligament. An attempt was made to remove the uterus, tubes, and ovaries without disturbing the attachment of the ovaries to their adjacent structures. This was only partially successful (see Figs. 11 and 13). The patient, fifty-three years old, was married but had never been pregnant.

strual period. Bits of endometrial tissue were found lying free in the veins about other endometrial cavities of the vaginal wall and embolic growths of endometrial tissue were also present in these vessels. The actual escape of the menstrual contents of two of these cavities into a vein was seen. I can see only one correct interpretation of the etiology of the embolic endometrial lesions in the veins about these endometrial cavities and that is they arose from the implantation of endometrial tissue, disseminated into the veins from the menstrual rupture of the walls of the endometrial cavities into these vessels. If so, endometrial tissue disseminated by menstruation in this instance must have been alive and capable of growing, when transferred to suitable situations.

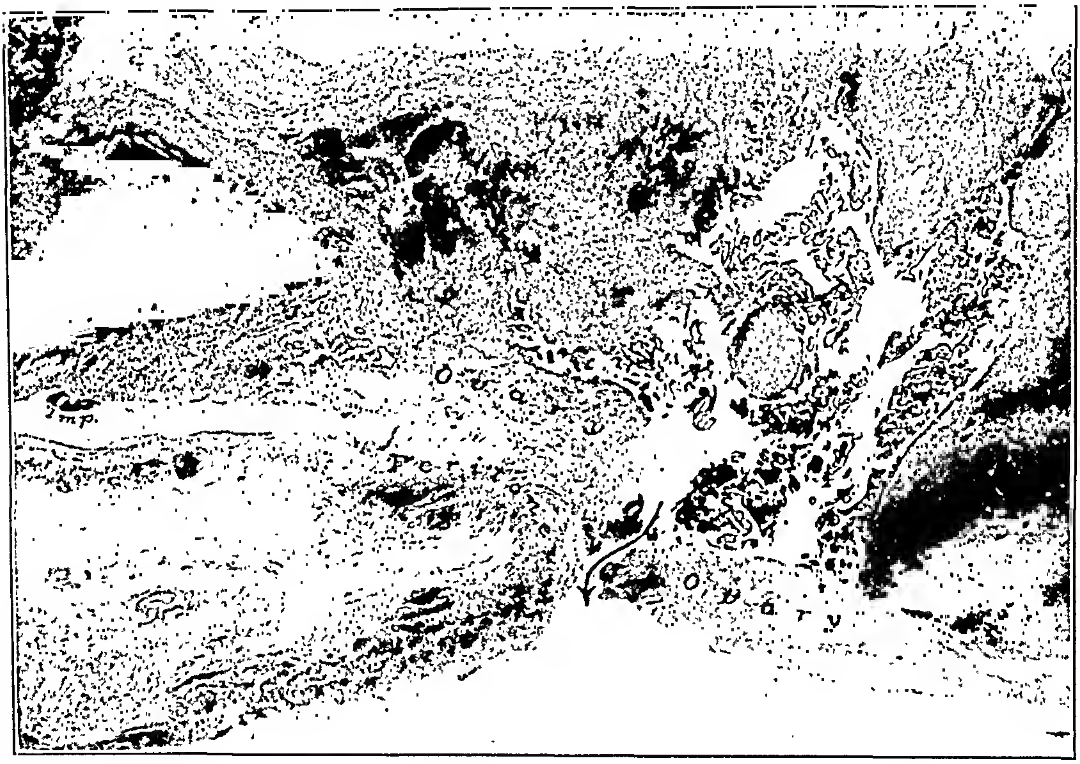


Fig. 11.—Photomicrograph (x 10) of a portion of the left ovary adherent by its lateral surface to the posterior layer of the broad ligament (Fig. 10). An endometrial cyst or cavity of the ovary, filled with fragments of endometrial tissue, is shown. Its wall is torn (see arrow) apparently due to the trauma of the operation and probably at the site of a previous perforation which had been subsequently closed by the fusion of the ovary with the posterior layer of the broad ligament at this point. An implantation-like patch of endometrial tissue (*imp.*) is situated on the lateral surface of the ovary and is similar to the fragments of endometrial tissue in the cavity and that filling the opening in its wall. This endometrial "implant" seems to be of more recent origin than the endometrial cavity, and, from the evidence presented in this section, might have arisen from tissue escaping through the perforation of the latter.

As a result of these studies in the menstrual dissemination of endometrial tissue into the venous circulation, the following three conclusions were drawn:

1. Fragments of endometrial tissue, at times, are disseminated into the venous circulation during menstruation from the mucosa lining the uterine cavity and also from ectopic endometrial foci.

2. Metastatic or embolic endometriosis may arise from the implantation of these emboli in near-by veins.

3. Endometrial tissue set free by menstruation, therefore, is sometimes not only alive but may actually grow, if transferred to situations favorable to its existence.

I might add a fourth conclusion. The veins and venous sinuses of the uterine and vaginal walls, under certain conditions, are favorable to the existence (growth) of endometrial tissue disseminated by menstruation.

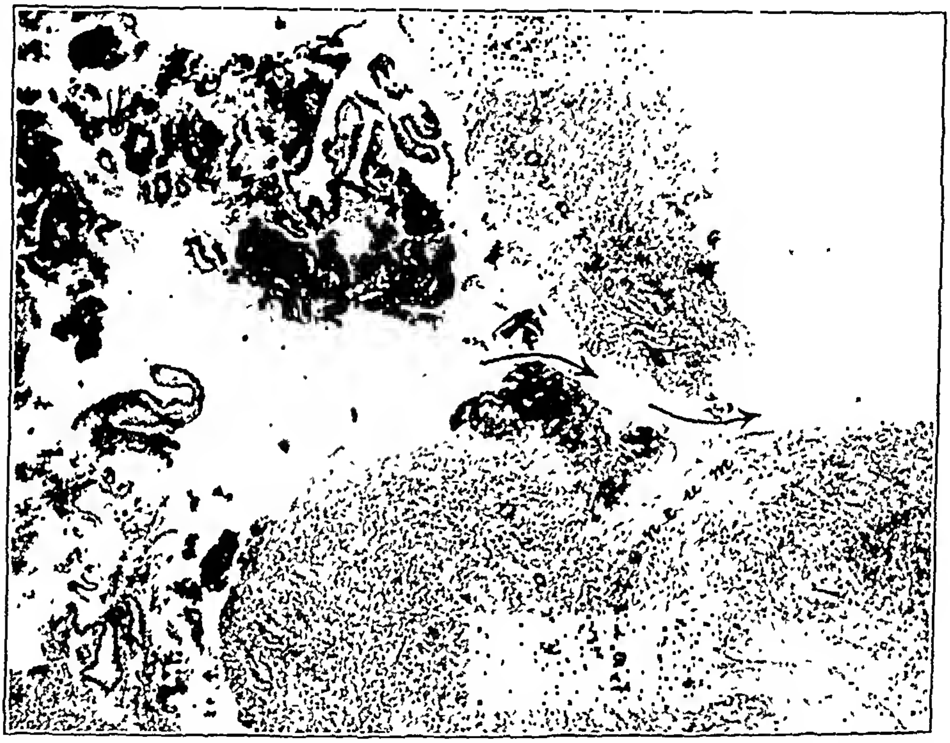


Fig. 12.—Photomicrograph (x 25) of the section, shown in the preceding illustration, at the site of the perforation of the endometrial cavity. The fusion of the fold of the peritoneum with the surface of the ovary indicates a reaction to some irritant escaping into the peritoneal cavity. The opening in the cyst wall indicates that this irritant may have been its contents. The endometrial "plug" filling the opening and attached to (implanted on) its sides suggests that this fragment of endometrial tissue had failed to escape through the perforation and was retained in this situation, or the endometrial lining of the cyst had grown out through the opening. Similar bits of endometrial tissue escaping from the cyst might have become implanted in other places, as the surface of the ovary (see *imp.* of the preceding illustration), the posterior surface of the uterus (Fig. 14), and even causing the peritoneal endometriosis, thus fusing the uterus with the sigmoid. The reaction of the endometrial lining of the cyst to menstruation would be the most likely cause of a perforation of the wall of the cyst.

EVIDENCE OF THE SUITABILITY OF THE PERITONEUM TO THE GROWTH OF ENDOMETRIAL TISSUE

If it can be shown that endometrial and tubal tissue will not grow on the peritoneum and cannot become implanted on it, no part of the implantation theory as an explanation of a cause of peritoneal endometriosis can be considered.

A study of the lesions of peritoneal endometriosis convinces one that endometrial tissue can and does grow on the pelvic peritoneum and also on the peritoneal surface of other structures which may be in the pelvic cavity but primarily did not arise in it, such as the appendix, the cecum, loops of the small intestine, and their mesenteries. We must conclude that the visceral and parietal peritoneum is suited to the growth of endometrial tissue, whatever the origin of the latter may be.

Jacobson[5] has shown by his experimental work in rabbits and monkeys that bits of the uterine mucosa of these animals, when scattered in their peritoneal cavities, give rise to a peritoneal endometriosis similar to that found in human beings. It is natural to assume that the endometrial tissue in these lesions arose from the implantation of the endometrial tissue "sown" on the surface of the peritoneum.

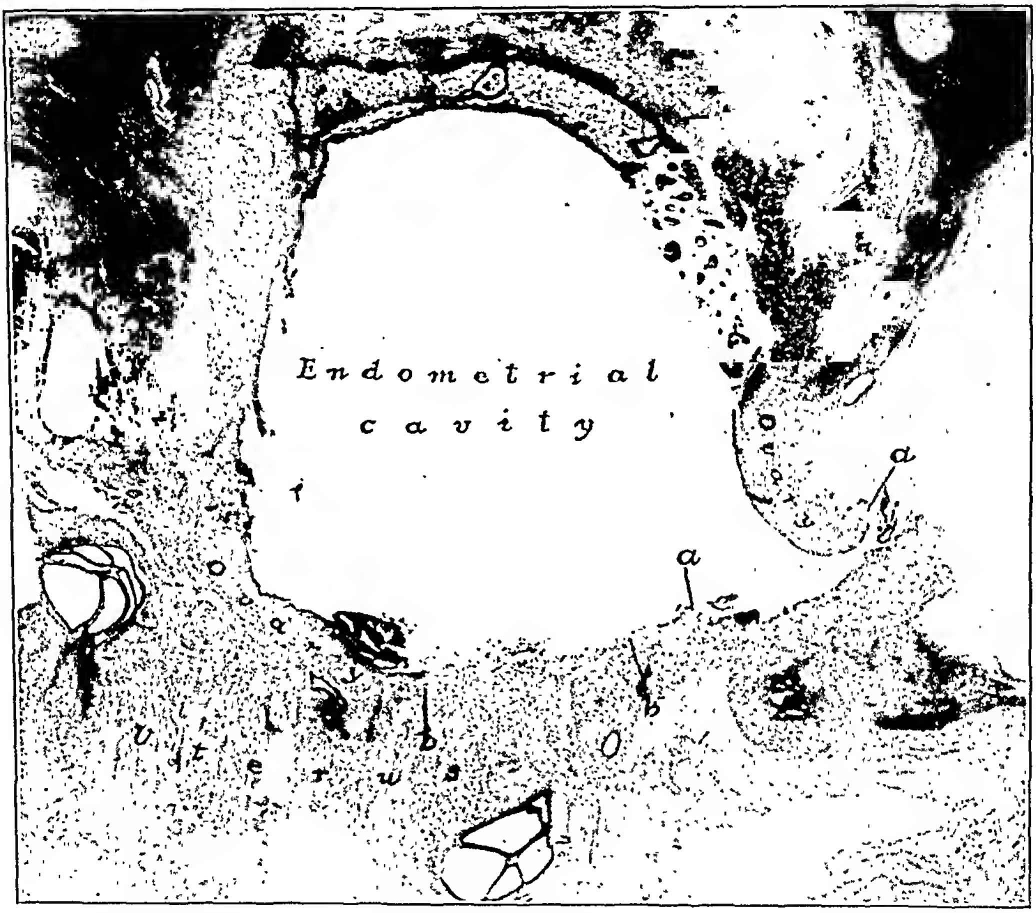
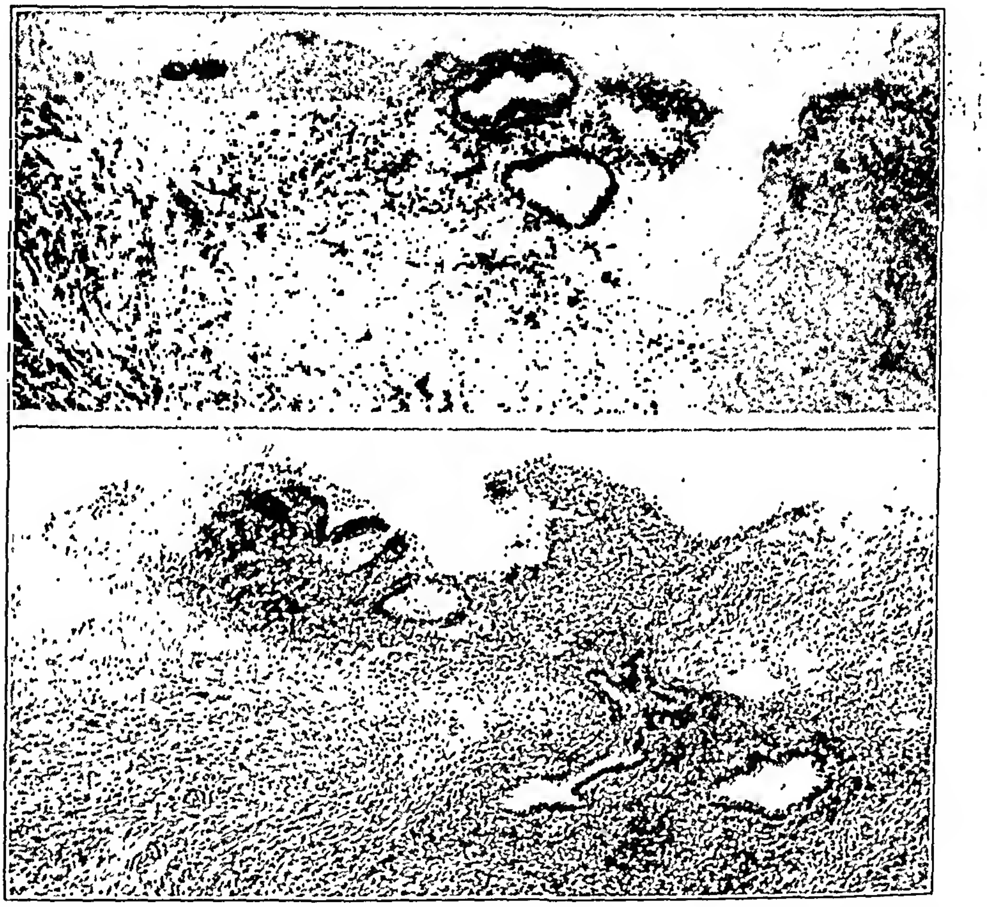


Fig. 13.—Photomicrograph (x 10) of a portion of the right ovary adherent to the posterior surface of the uterus (Fig. 10). An endometrial cyst or cavity of the ovary is shown with its wall *a*, torn from its former attachment to the uterus at *a* by the trauma of the operation. The chocolate-like contents of the hematoma or cyst escaped at that time. There is a gap *b-b* in the portion of the wall of the cyst adherent to the uterus. This gap is filled by the posterior surface of the uterus, thus completing or closing the endometrial cavity. This condition can be explained either by the rupture or by perforation of an endometrial cyst, and the subsequent closure of the opening by the ovary becoming adherent to the uterus or else endometrial tissue developing on the surface of the ovary caused adhesions (possibly due to its menstrual reaction) which fused the ovary to the uterus, and an endometrial cavity developed in this situation. In either instance menstrual blood might have escaped into the peritoneal cavity and a peritoneal endometriosis developed, as indicated by the "deposits" of endometrial tissue on the surface of and embedded in the uterine wall (see also Fig. 15).

If bits of endometrial tissue, carried by menstrual blood escaping into the venous circulation of the uterus sometimes become implanted on the endothelial surface of the veins and venous sinuses of the uterine wall and a like condition arises in the vaginal veins from the menstrual reaction of the mucosa of ectopic endometrial cavities in that situation, we might infer that bits of endometrial tissue, carried by menstrual blood escaping into the peritoneal cavity from any source, might become implanted on the mesothelial surface of the peritoneum and give rise to at least some of the lesions of peritoneal endometriosis.



Figs. 14 and 15.—Two photomicrographs (x 60) of implantation-like lesions on the posterior surface of the uterus. The first was situated beneath the distal pole of the adherent left ovary shown in Fig. 10, and would seem to be of more recent origin than the endometrial cavity of the ovary with evidence of perforation shown in Fig. 11. Similar lesions were also present on the lateral surface of the ovary. The second was situated near the right ovary (Figs. 10 and 13) also with evidence of rupture of its endometrial cavity and dissemination of its contents into the pelvis. If these near-by lesions arose from the escape of the contents of the endometrial cavities of the ovaries, the endometriosis of the culdesac might have had a similar origin.

The peritoneum of rabbits and monkeys evidently is adapted to the implantation of endometrial tissue disseminated in the peritoneal cavities of these animals, but is the peritoneum of women adapted to the implantation of this or any other tissue escaping into their peritoneal cavities? Cancer escaping into the peritoneal cavity sometimes becomes implanted on the surface of the peritoneum, causing the lesions of peritoneal carcinosis. Could endometrial tissue escaping into the peritoneal cavity sometimes become implanted on the surface of the peritoneum and cause the lesions of peritoneal endometriosis? Some will say "cancer is invasive and metastasizes by other channels." Endometrial tissue is sometimes also invasive and mestasizes by vascular channels.

We have shown that the peritoneum is suited to the growth of endometrial tissue, and it will be difficult to deny that endometrial tissue can become implanted on the peritoneum, if it can be demonstrated that this tissue escapes into the peritoneal cavity and the lesions of peritoneal endometriosis occur in situations and under conditions indicating their possible origin from such a source.

THE MENSTRUAL DISSEMINATION OF ENDOMETRIAL TISSUE INTO THE PERITONEAL CAVITY FROM ECTOPIC ENDOMETRIAL FOCI

Evidence has been presented of the viability of endometrial tissue disseminated by menstruation and that it will grow when transferred to suitable situations. We have shown that the peritoneum is suited to the growth of endometrial tissue and furthermore that cancer becomes implanted on it. We might infer that endometrial tissue which, at times, is invasive and metastasizes through vascular channels might also become implanted on the peritoneum. Should it be shown that endometrial tissue carried by menstrual blood escapes into the peritoneal cavity from any source, we would have strong presumptive evidence that under favorable conditions this tissue might become implanted on the peritoneum and cause peritoneal endometriosis. Should these lesions occur in situations and under conditions indicating or even suggesting their origin from such a source, this evidence would be still stronger.

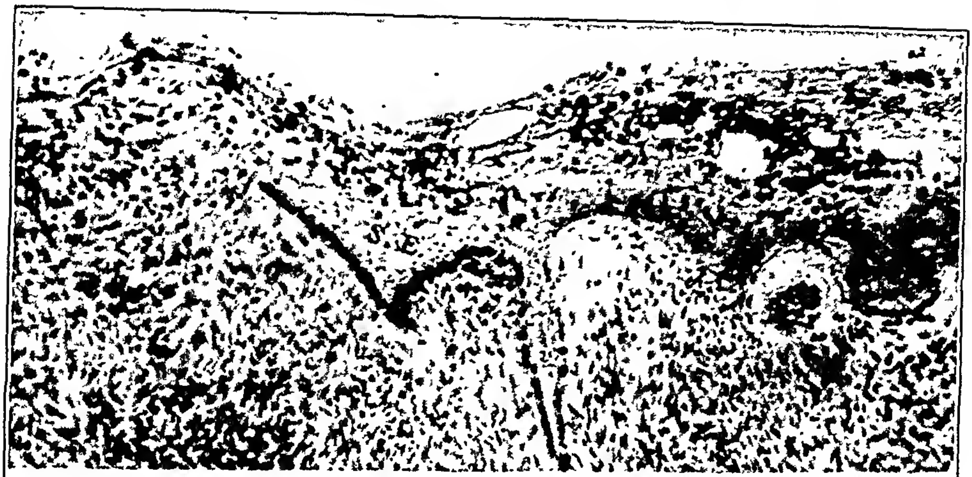
Three possible sources from which menstrual blood might escape into the peritoneal cavity may be considered.

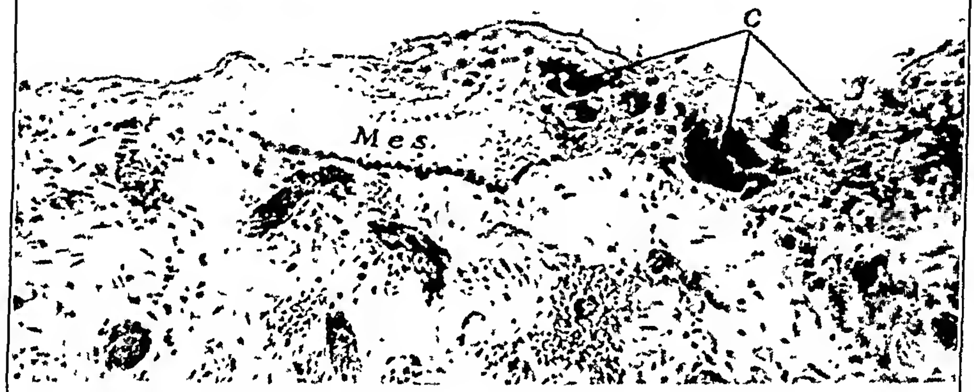
1. The menstrual rupture or perforation of the wall of an endometrial cavity (cyst), most frequently seen in the ovary.

2. The menstrual reaction of endometrial tissue growing on the peritoneal surface of the ovary or any pelvic organ or structure.

3. A back flow through the tubes from the uterus and also possibly from the menstrual reaction of the tubal mucosa.

We know that endometrial cavities in the vaginal wall, at times, rupture into the vaginal canal during menstruation and occasionally must discharge bits of endometrial tissue with the menstrual blood. (Fig. 1). Similar cavities in the abdominal scars of patients with endometriosis in that situation sometimes rupture and discharge blood at the menstrual period. We could infer that like cavities (cysts) in the ovary or in any pelvic organ or structure, at times, must rupture into the peritoneal cavity during menstruation. The study, at operation, of endometrial cysts or hematomas of the ovary shows that the ovary is usually adherent by its *lateral* or *under* surface to the side of the pelvis, posterior layer of the broad ligament, or the posterior surface of the uterus (Figs. 2,





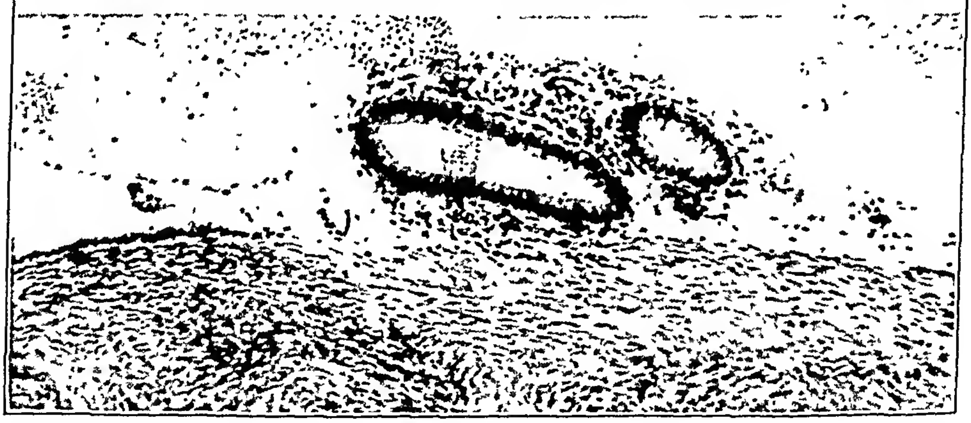


Fig. 16.—Photomicrograph (x 130) showing the reaction of the surface of the ovary to gonorrheal infection escaping through the tubes. An inflammatory exudate is present on the surface of that organ which consists of fibrin, leucocytes and wandering cells derived from the tissues of the ovary. The greater portion of the surface epithelium has disappeared. In the center of the photomicrograph it (*s.c.*) is still present and the exudate has arched over it. If the irritation had continued, the exudate would be replaced by granulation tissue and later by connective tissue with resulting thickening of the ovary or adhesion to adjacent structures. As the result of this reaction to infection, many interesting gland-like structures and cavities lined by the surface epithelium of the ovary arise from the inclusion of this epithelium and its subsequent growth, but they never develop into peritoneal carcinosis or true peritoneal endometriosis.

Fig. 17.—Photomicrograph (x 130) showing the reaction of the surface of the parietal peritoneum to the implantation of cancer, secondary to ovarian cancer. The exudate of Fig. 17, replaced by granulation tissue, is arched over the portion of the mesothelium (*mes.*) which has not disappeared, just as the exudate in Fig. 16 is arched over the surface epithelium of the ovary. Clumps of cancer cells (e) caught in the exudate now appear enmeshed in the granulation tissue. As a result of the peritoneal reactions in the implantation of cancer, many interesting lesions result.

Fig. 18.—Photomicrograph (x 130) showing the reaction of the surface of the ovary to the "implantation" of endometrial tissue. Multiple endometrial lesions were

10, 11 and 12). On freeing the ovary, the hematoma or cyst usually ruptures at the apparent seat of a previous perforation and its chocolate-like contents escape into the pelvis (Figs. 19 and 26). Adhesions are always present and often in situations easily soiled by material which might have escaped from a perforation of the ovarian cyst or hematoma. Endometrial tissue is often present in these adhesions and invades the structures involved by them. The question naturally arises: What is the relation between the endometrial tissue lining the cyst of the ovary and that scattered about in the implantation-like lesions of the associated peritoneal endometriosis?

The endometrial tissue in the ovary and that in the peritoneal lesions must have had a common origin or else one is secondary to the other. Should those involving the peritoneum arise from the escape of the contents of the cyst, they must be due either to the stimulation of the peritoneum by some specific element of the cyst contents or else to the implantation of bits of endometrial tissue carried by the contents of the cyst escaping into the peritoneal cavity.

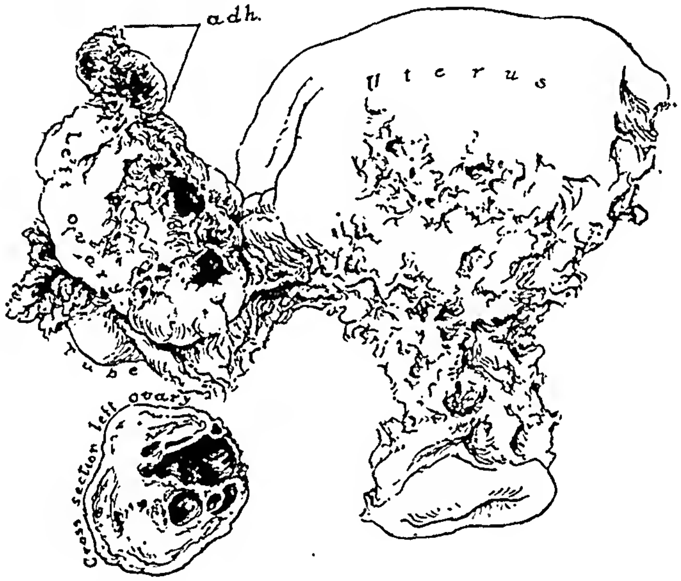


Fig. 19.—Posterior view of the uterus and left tube and ovary (x ⅔). The uterus was retroflexed and firmly adherent due to an extensive peritoneal endometriosis. The uterus, left tube, and ovary were removed and a portion of the right ovary was resected. An endometriosis superficially involved the greater portion of the posterior surface of the uterus. The left ovary was firmly adherent by its *lateral* and *under surfaces* to the posterior layer of the broad ligament and the posterior surface of the uterus. On freeing the ovary the characteristic chocolate-like contents of the ovarian hematoma escaped, possibly through the site of a previous perforation of the hematoma (see cross-section of the ovary). The ovary has been lifted up in order to show the adhesions and endometrial lesions on its *under* and *lateral surfaces.* Both tubes were *patent.* For photomicrographs of sections of the ovaries and uterus, see Figs. 20, 22, 23, and 24. The patient, thirty-six years old, had one child.

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present on the *lateral surface* of the right ovary (see Fig. 29). The endometrial tissue in this illustration may have been derived either from the implantation of similar tissue from other endometrial lesions on the ovary (Fig. 30), from endometrial or tubal tissue escaping through the tubes (both were patent) or from a localized metaplasia of the surface epithelium of the ovary. The surface epithelium is intact at both ends of the illustration, but has disappeared beneath the endometrial tissue. The latter is enmeshed in an exudate somewhat similar to those shown in Figs. 16 and 17. Histologically it resembles an implantation lesion.

Clinical observations have taught us that these cysts sometimes rupture or perforate during menstruation and some of their contents escape into the pelvic cavity. A histologic study of ovarian endometrial cysts, removed during menstruation, demonstrates that the lining of these cysts sometimes reacts to menstruation, as does the mucosa lining the uterine cavity (Figs. 2 and 3), and bits of its endometrial tissue are disseminated into the cavity of the cyst. See Figs. 4 and 5. Therefore, they would be carried into the peritoneal cavity on rupture of the cyst. We have indications that endometrial tissue disseminated by menstruation is sometimes alive and will grow when transferred to suitable situations and also that the peritoneum is suited to the growth of endometrial tissue. Furthermore, the lesions of peritoneal endometriosis often occur in situations and under conditions indicating their origin from the escape of the contents of these cysts into the peritoneal cavity. The peritoneal reaction to this tissue is similar to that of peritoneal carcinosis of implantation origin. We, therefore, have sufficient evidence to believe that peritoneal endometriosis sometimes arises from the implantation of endometrial tissue carried by menstrual blood escaping through a perforation of an endometrial (cavity) cyst of the ovary or any other pelvic structure. (Figs. 6, 10, 19, and 26.)

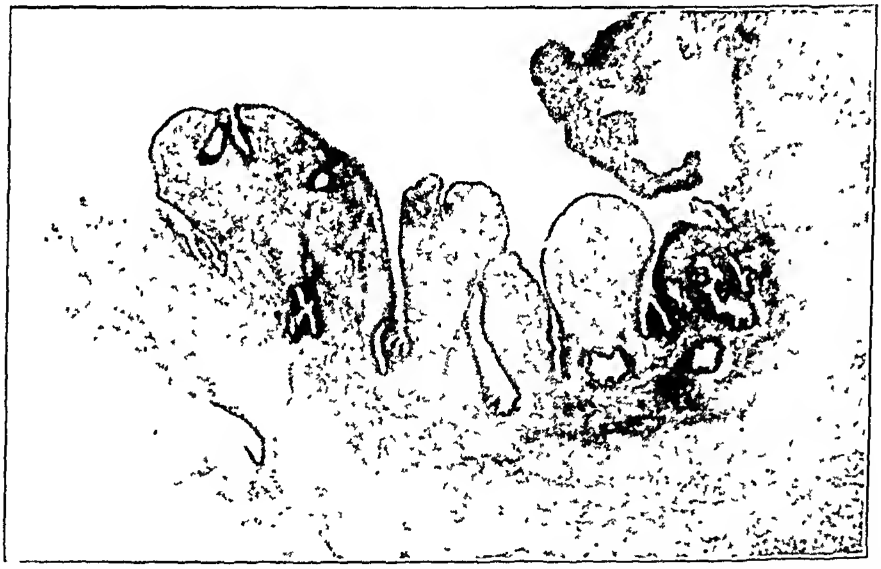
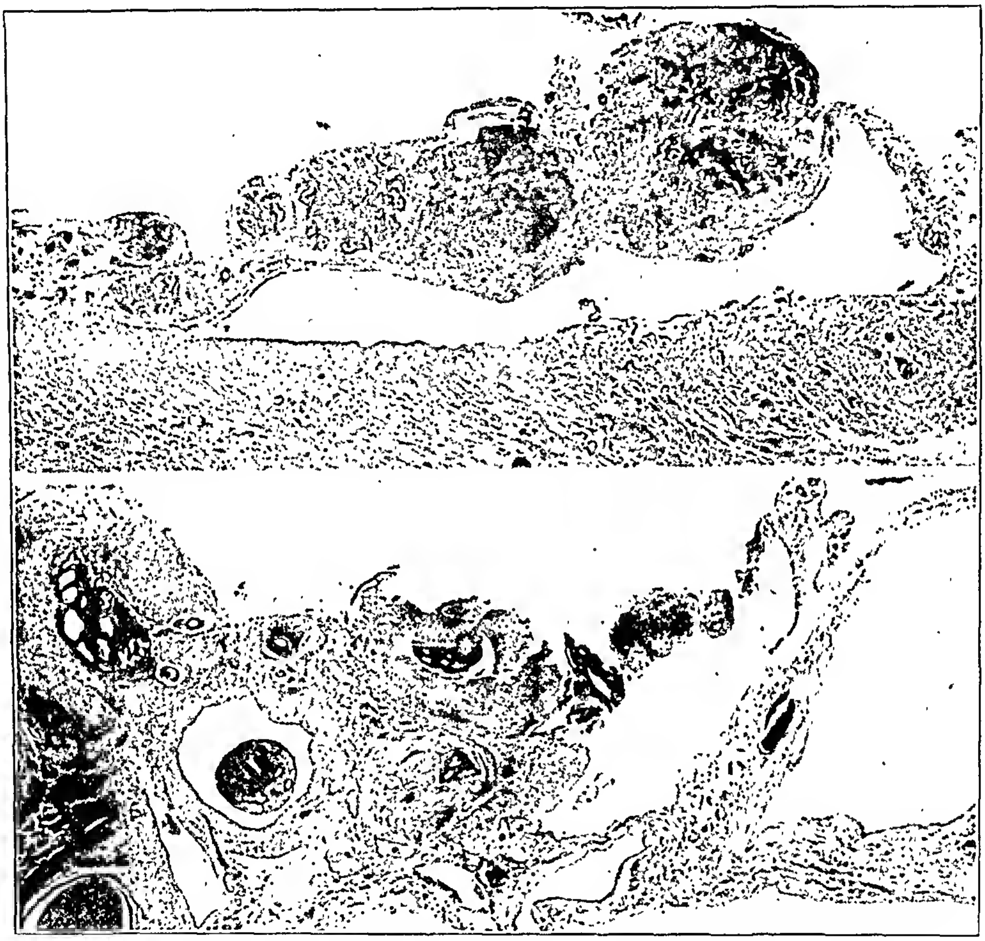


Fig. 20.—Photomicrograph (x 25) showing the lining of an endometrial cavity of the left ovary of Fig. 19 and near the apparent site of a previous perforation. Typical endometrial tissue is present.

Endometrial tissue has been found growing on the surfaces of all of the pelvic organs and structures, including the cecum, appendix, loops of the small intestines, sigmoid, and their mesenteries. The patches of endometrial tissue on the ovary nearly always occur on the *lateral* and *under surfaces* of that organ, and these surfaces when they contain endometrial tissue are usually adherent to adjacent structures. The endometrial tissue on the other organs and structures also is often surrounded by adhesions. Some of these patches of endometrial tissue, at times, evidently react to menstruation, just as does the uterine mucosa (Figs. 48, 49, and 50). Menstrual blood occasionally must escape from some of these endometrial foci into the peritoneal cavity. There are, therefore, strong indications that peritoneal endometriosis, at times, spreads in this manner. Because these foci are usually small and are often associated with adhesions and become embedded in the underlying organ or structure, the opportunity for the menstrual dissemination of endometrial tissue from them probably is not very great except early in their existence.



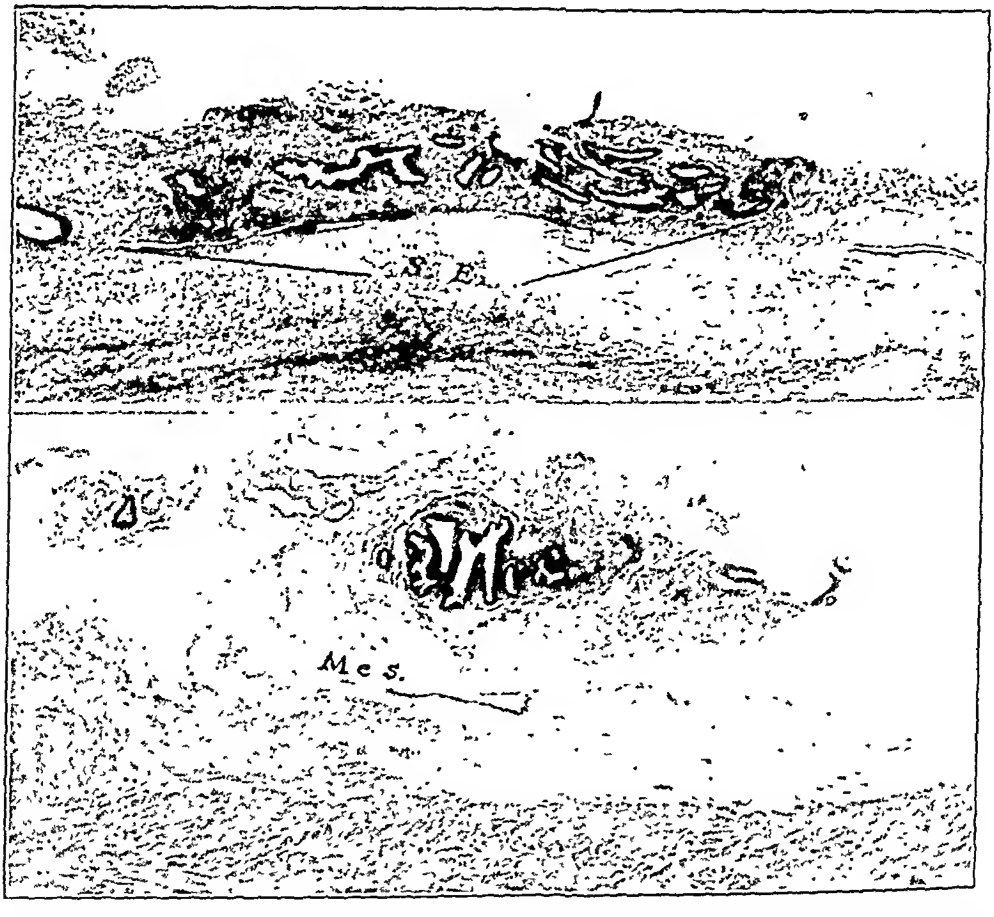
Figs. 21 and 22.—Two photomicrographs (x 10), the first of adhesions on the surface of the uterus, from a patient with peritoneal carcinosis secondary to ovarian cancer. It is but an exaggeration of the condition shown in Fig. 17. Bits of cancer had been caught in the exudate arising from the reaction of the peritoneum to cancer cells escaping into the peritoneal cavity. The subsequent transformation of the exudate into granulation tissue and then connective tissue, together with the growth of the cancer cells, evidently caused the lesion shown here. Compare with Figs. 22, 23, and 24.

The second is of adhesions extending from the left ovary to the uterus, from a patient with peritoneal endometriosis associated with (or secondary to) ovarian endometriosis, with evidence that an endometrial cyst might have ruptured into the peritoneal cavity (Fig. 19). A portion of the ovary is shown at the left with endometrial tissue embedded in it. The origin of the endometrial tissue in these adhesions would seem to be similar to that of cancer in the adhesion of Fig. 21 and the latter was of implantation origin. See also Figs. 23 and 24.

THE MENSTRUAL DISSEMINATION OF ENDOMETRIAL TISSUE THROUGH THE TUBES FROM THE UTERINE CAVITY

Objections have been made to the theory that bits of endometrial tissue are carried by menstrual blood escaping through the tubes and become implanted on the visceral and parietal peritoneum. The following are the more important of these objections:

1. Menstrual blood rarely, if ever, escapes from the uterine cavity into the tubes.



Figs. 23 and 24.—Two photomicrographs (x 25), the first of a patch of endometrial tissue on the *lateral surface* of the ovary (Fig. 19). An inclusion of the surface epithelium of the ovary is shown at *s.e.* The endometrial tissue is situated above it and evidently in ovarian tissue which has arched over the surface epithelium of the ovary as in the peritoneal reactions shown in Figs. 16, 17, and 21.

The second is of adhesions on the posterior surface of the uterus (Fig. 19), containing endometrial tissue. There has been a peritoneal reaction to some irritant causing adhesions and a mesothelial inclusion (*mes.*), the latter due to granulation tissue arching over the mesothelial surface of the peritoneum. Endometrial tissue is embedded in the adhesions above the mesothelial inclusion just as cancer of implantation origin becomes embedded in the adhesions of peritoneal carcinosis (Fig. 21). The peritoneal endometrial lesions possibly are of more recent origin than the endometrial cyst of the ovary and from evidence found at operation, it would seem that they might have arisen from the escape of the contents of the ovarian cyst into the pelvis (Fig. 19).

2. The lumen of the interstitial portion of the tube is too small for bits of endometrial tissue to pass through it.

3. Endometrial tissue, set free by menstruation, is dead or dying and therefore incapable of implantation.

4. Several days must be required for endometrial tissue to be carried from the uterine cavity through the tubes, and, therefore, there is little chance that "such degenerative tissue" after "probably many days of continuing degeneration and autolysis should grow where it falls." Novak.[4]

Novak[6] states that my theory would be greatly strengthened, if I could demonstrate two things.

1. The capacity of the degenerated endometrium given off at menstruation to grow in tissue culture.

2. The capacity of such endometrium to grow in the peritoneum or ovary of the human being or perhaps even of one of the lower animals.

I have examined menstrual blood obtained both from the vagina and also from the cavities of uteri removed at operation. The endometrial tissue obtained from these sources did not always show degenerative changes, but frequently presented a normal appearance (Fig. 47). This, however, does not prove that it is alive and capable of growing, even if transferred to suitable situations. Evidence has already been given to show that endometrial tissue disseminated by menstruation into the venous circulation, at times, becomes implanted in the sinuses of the uterine wall and in one instance in veins about endometrial cavities in the posterior vaginal wall. Evidence has also been presented to show that endometrial cavities (cysts) of the ovary, at times, discharge their contents, containing endometrial tissue cast off by menstruation, into the pelvis and that peritoneal implantations of this tissue arise from this source. It has also been demonstrated by this and other observations that the visceral and parietal peritoneum is suited to the growth of endometrial tissue.

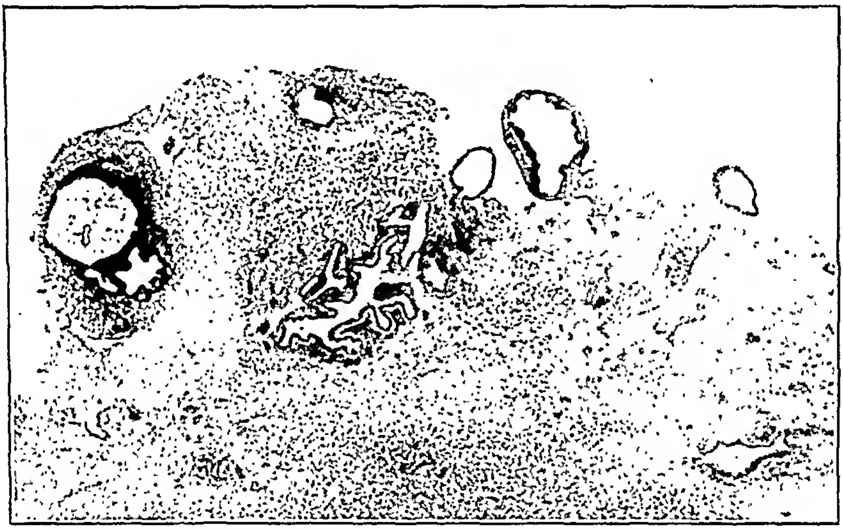


Fig. 25.—Photomicrograph (x 25) of a portion of the right ovary (case of Fig. 19). An apparent endometrial lesion was situated on its *lateral surface*. It is evidently of more recent origin than the endometrial cyst of the opposite ovary (see Fig. 19). Should the endometrial tissue in this case have arisen from the differentiation of celomic epithelium due to its stimulation by an ovarian hormone, we should expect that these lesions would all be of the same age.

If bits of endometrial tissue could be carried through the interstitial portion of the tubes by menstrual blood escaping from the uterine cavity into these ducts and not spend too long a time in their transit, one would expect that peritoneal implantations of this tissue might occur from this source.

Over twelve years ago I began a series of experiments to determine the shape of the uterine cavity in normal and in pathologic conditions.[5, 6] The technic was as follows: the uterus removed at operation or autopsy was placed in a basin of warm water and then filled with melted gelatin (about 15 per cent) containing in suspension bismuth subcarbonate or barium sulphate. This was introduced through the cervical canal by means of a syringe. After filling the uterine cavity the syringe was withdrawn, the cervix clamped in order to prevent the escape of the injection mass and the specimen placed in cold water until the gelatin had solidified. The uterus then was fixed in formalin. On filling the uterine cavity, the mass would usually easily escape through the tubes, if the latter were patent. Roentgenograms (especially stereoscopic ones) of the hardened uterus enabled one to obtain a clear picture of the form of the uterine cavity under various conditions and also of the course and relative diameters of the interstitial portions of the tubes. Many uteri were studied in this manner. In some the interstitial portion of the tubes appeared as a mere thread in the roentgenograms and in others as a relatively large canal. The results of some of these studies[7] were presented before this society nine years ago. Two of the illustrations of that paper are again reproduced, one showing a uterus with very

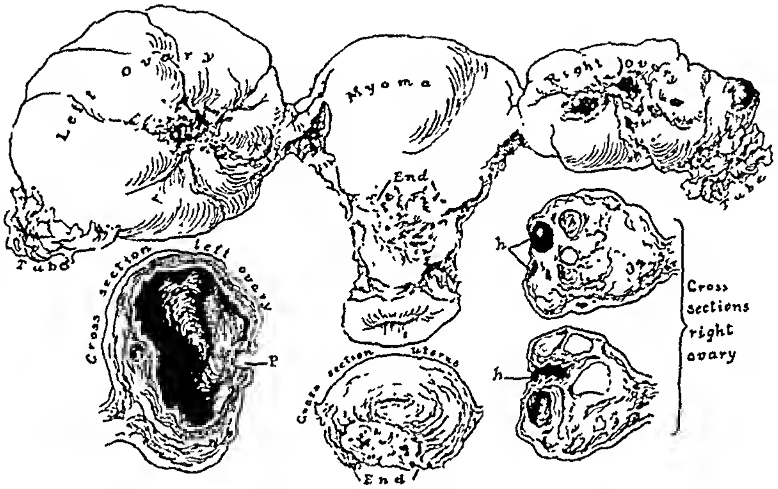
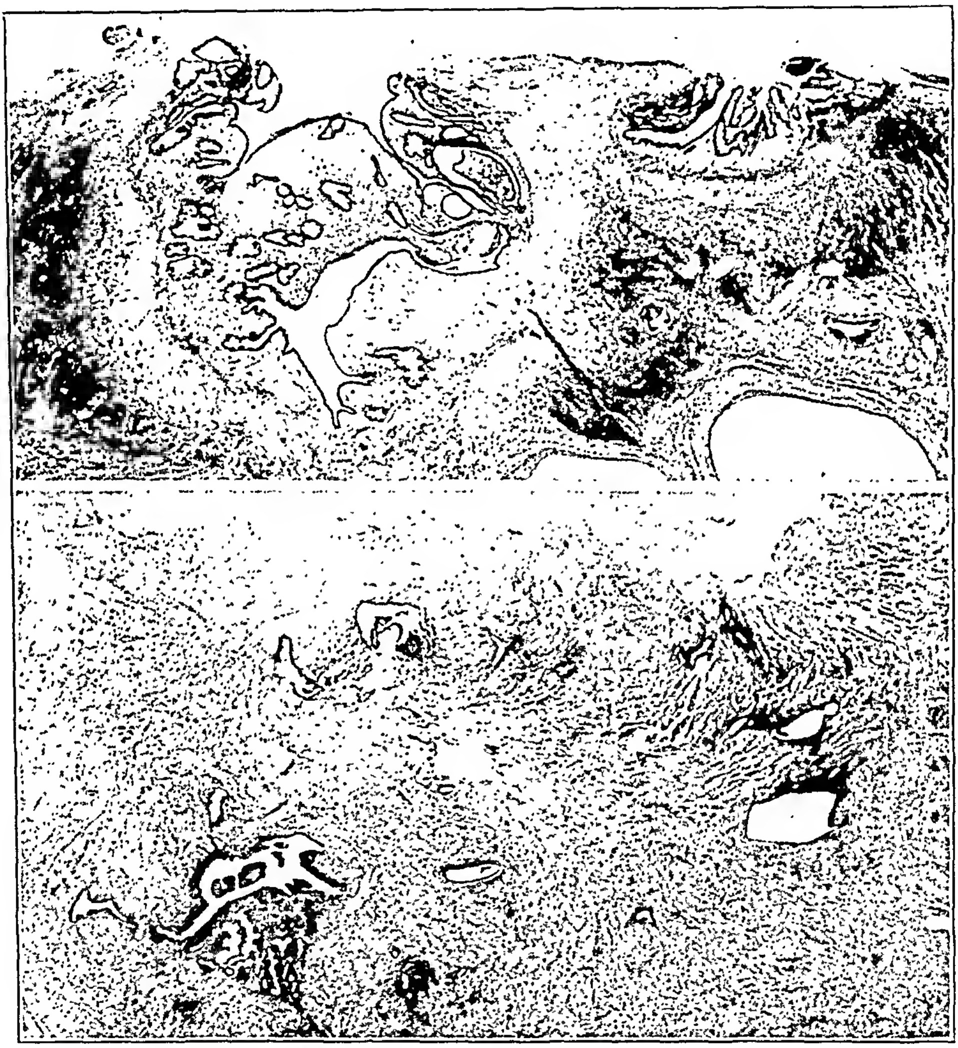


Fig. 26.—Uterus, tubes, and ovaries (x ½). The uterus was retroflexed and adherent due to peritoneal endometriosis. An intramural leiomyoma is present in the posterior wall of the body of the uterus. An endometriosis involved the uterus at the junction of the body and the cervix, invading its wall (see Fig. 28). The left ovary was adherent by its *lateral surface* to the side of the pelvis. On freeing it, the chocolate-like contents of the ovarian hematoma escaped, possibly through the site of a previous perforation of the hematoma (see also cross-section of the ovary). The right ovary was adherent by its *lateral surface* to the posterior layer of the broad ligament. Multiple endometrial lesions involved the posterior surface of the right ovary (see cross-sections of the ovary and Fig. 27). Both tubes were patent. The patient, thirty-one years old, was married but had never been pregnant.

narrow interstitial portions of the tubes and the other with dilated ones (Figs. 40 and 41). I suggested at that time that menstrual blood under favorable conditions might escape through the tubes into the peritoneal cavity. Since then I have been greatly interested in the menstrual regurgitation of blood into the tubes and have operated upon many patients during their menstrual period and have occasionally observed this phenomenon (eight cases). I have also found endometrial tissue in the lumina of tubes removed during menstruation. It seemed to me that the blood in the tubes in these eight cases came from the uterine cavity. It was present in both tubes in each instance. However, the source of endometrial tissue in the lumina of the tubes is a debatable one and if it can be shown that the interstitial portion of the tubes is



Figs. 27 and 28.—Two photomicrographs (x 10), the first shows some of the endometrial lesions of the right ovary of the preceding illustration. They are evidently of more recent origin than the endometrial hematoma of the opposite ovary.

The second is of the endometriosis of the posterior uterine wall. There is apparently an invasion of the uterine wall from tissue implanted or developing on its peritoneal surface. If the former, it might have been derived from endometrial tissue escaping either from the ovary or from the tubes; both of the latter were patent.

always so small that bits of endometrial tissue cannot pass through it, the peritoneal implantation of endometrial tissue from this source can be eliminated.

The roentgenograms of the injected uteri suggested that the interstitial portion of some tubes is sufficiently great to permit bits of endometrial tissue to pass through it (Figs. 40, 41, and 42). Can it be proved that blood escaping from the uterine cavity into the tubes will actually carry with it bits of endometrial tissue?

I have often observed blood dripping from the abdominal ostia of the tubes in abdominal operations which had been preceded by a curettage of the uterus. I do not understand just why this should occur. Bits of endometrial tissue, apparently set free by the curette, were found in the lumina of tubes which had been removed and some of those pieces were larger than similar pieces of endometrial tissue set free by menstruation (Figs. 44 and 46). If endometrial tissue set free by curettage is carried by blood escaping from the uterine cavity into the tubes, similar tissue set free by menstruation might be carried with menstrual blood escaping from the uterine cavity into the tubes. Also, the time required for menstrual blood to go from the uterine cavity into the tubes might be very short, not several days but a few moments

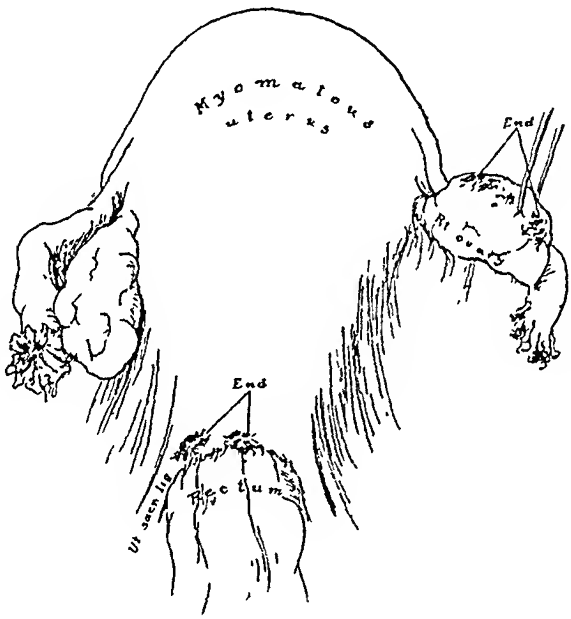


Fig. 29.—Uterus (containing a submucous leiomyoma), tubes, and ovaries drawn upwards (x ½), showing a peritoneal endometriosis obliterating the bottom of the culdesac and involving the left uterosacral ligament (Fig. 31). Multiple endometrial lesions are present on the *lateral surface* of the right ovary (Figs. 18 and 30). Both tubes were *patent*. The peritoneal endometriosis in the culdesac is in a situation easily soiled by material escaping from the tubes or ovaries, and that of the right ovary is on a surface of that organ, which would readily be contaminated by material escaping from the tube. The lateral surface of the ovary normally lies against the posterior layer of the broad ligament or side of the pelvis and thus a crevice is formed which would retain any material lodging in it. The lesions are situated on the dependent portion of the ovary, namely, the bottom of the crevice. The patient, forty-five years old, was single.

and possibly no longer than that taken by uterine bleeding from a curettage.

These observations demonstrate that blood escaping from the uterine cavity into the tubes, at times, can carry with it bits of endometrial tissue and that the time required for this may be very short.

Fragments of endometrial tissue have been found in the lumina of tubes removed at operation. What is the possible origin of this tissue? I believe that endometrial tissue in the lumen of the tube may arise from the following sources; (1) artefacts; (2) carried by blood escaping from the uterine cavity during or after curettage; (3) from the menstrual reaction of endometrial tissue forming a part of the tubal mucosa; (4) from ectopic endometrial tissue in the pelvis (Novak); (5) carried by blood escaping into the tubes from the uterine cavity during menstruation.

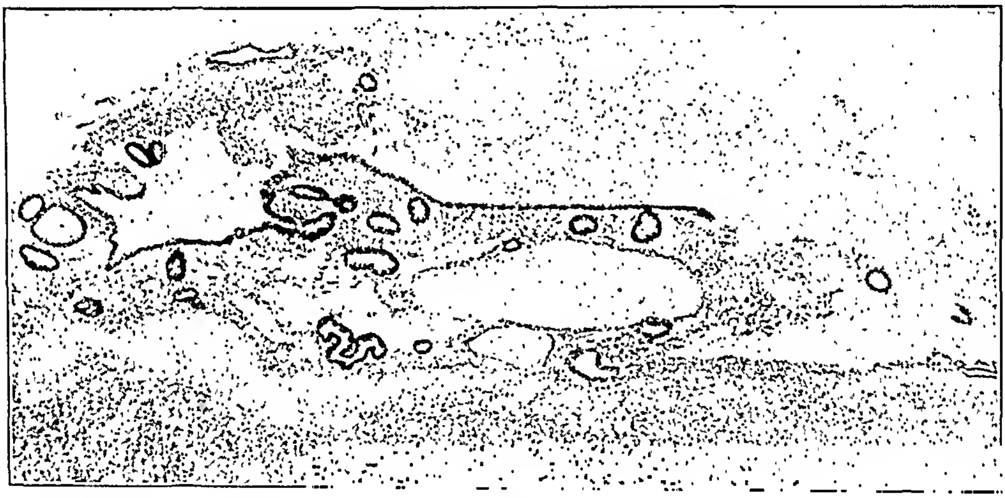


Fig. 30.—Photomicrograph (x 25) of a portion of the right ovary (Fig. 19). Typical endometrial tissue is present. In the menstrual reaction of this tissue bits of it might be set free, escape in the culdesac, or lodge in any of its natural pockets. They might also lodge on other portions of the ovary. Multiple endometrial lesions in different stages of development were present on the lateral surface of this ovary (see Fig. 19). They are often found on the peritoneal surface of structures adjacent to such an ovary. It is conceivable that such lesions on the surface of the ovary primarily might have arisen from endometrial tissue escaping through the tubes.

For some time I have been interested in the study of the menstrual dissemination of endometrial tissue into the venous circulation. Bits of the uterine mucosa were found in the veins and sinuses of menstruating uteri. A careful study of these sections and the technic of embedding the blocks, from which they were cut, convinced me that some of these findings were due to artefacts. The menstruating uterine mucosa is very friable; fragments break off during the embedding of the blocks of the uterus and some of these may lodge in the gaping veins and sinuses of the uterine wall. They appear as endometrial emboli in the stained sections (see Figs. 19, 20, and 21 of previous article[2]). If, however, fragments of the uterine mucosa are found surrounded by blood in a vessel or attached to its wall by fibrin, it is evident that it reached this situation before the tissues were fixed. It occurred to me that bits of endometrial tissue floating about in the embedding solutions could lodge in the lumen of the ampulla of the tube as readily as in the gaping vessels of the uterine wall. A "block" of the ampulla of the tube would furnish a very convenient "basket" for any scraps of tissue floating about in the embedding solutions which were small enough to enter its lumen. Bits of uterine mucosa and barium sulphate were purposely placed in the solutions, in which blocks of tubes were being embedded. Both barium sulphate and pieces of uterine mucosa were found in sections from some of these tubes (Fig. 39). Just as faulty technic sometimes plays an important rôle in placing (disseminating) bits of endometrial tissue in the lumina of the gaping vessels of the uterine wall, it may also place such tissue in the lumen of the fallopian tube. It is difficult to estimate to what extent artefacts and curettage of the uterus have contributed to the etiology of the endometrial tissue in the tubes which have been described in the literature of this subject. This is a problem for each laboratory worker to decide for himself.

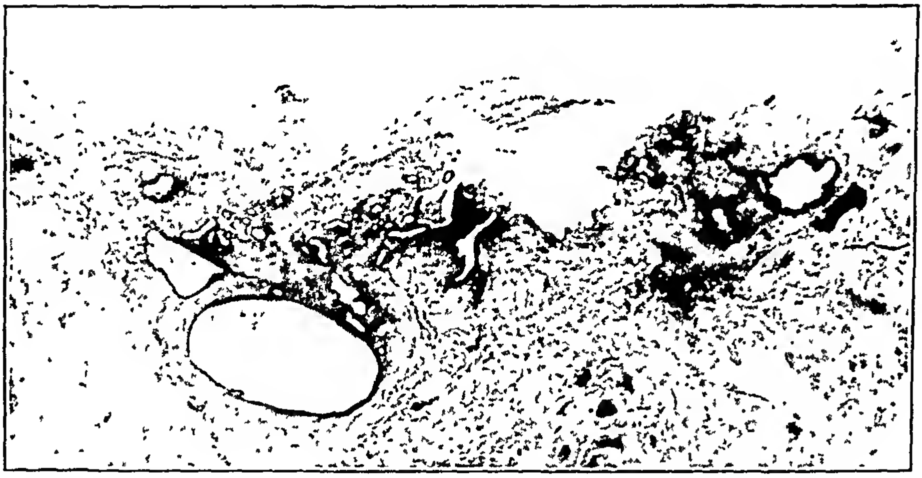


Fig. 31.—Photomicrograph (x 10) of the endometriosis of the left uterosacral ligament (Fig. 29). The endometrial tissue evidently has invaded this structure from its peritoneal surface. It was in a situation easily soiled by material escaping from the ovaries or the tubes. It must have arisen either by metaplasia of the peritoneum or from an implantation of endometrial tissue.

The histologic picture of tubes with bits of endometrial tissue set free by curettage differs from that of tubes containing endometrial tissue due to artefacts. In the latter the endometrial tissue lies free in the lumen of the tube (Fig. 39), while in the former it is embedded in blood (Fig. 46) which has obviously come from the uterine cavity, unless the blood has escaped from the tube after its removal. In recent years I have ligated the distal ends of tubes containing blood before removing them. An interesting problem arises and that is the fate of endometrial tissue carried by blood escaping into the tubes during curettage. Could it sometimes be retained in the lumen of the tube and even live and actually increase in size or may it escape into the peritoneal cavity and sometimes become implanted on the pelvic peritoneum? Davis[8] has reported an interesting case suggesting the latter.

Theoretically it is possible for bits of endometrial tissue to be set free in the lumen of the tube from the reaction of the tubal mucosa to menstruation (Fig. 58).

Novak has published photomicrographs of sections of tubes showing endometrial tissue in their lumina and offers the theory that this tissue might have come from ectopic endometrial tissue in the pelvis and entered the tube through its abdominal ostium, just as the ovum and particles of cancer in peritoneal carcinosis are known to enter the tubes. I believe that this occasionally might occur from the rupture of an endometrial cyst (cavity) and also from the menstrual reaction of endometrial tissue growing on the surface of the ovary and other pelvic structures. Endometrial tissue on the ovary nearly always oc-

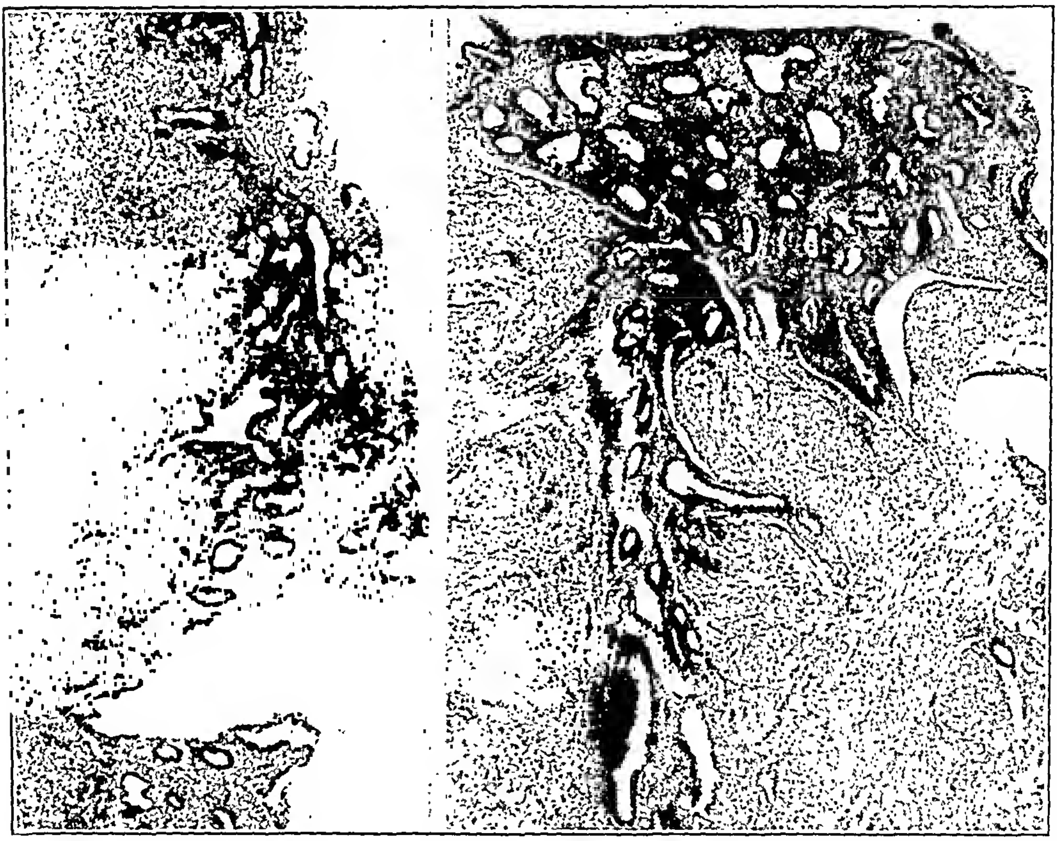


Fig. 32.—Two photomicrographs (x 25), the first of the lateral surface of the left ovary and the other of the adjacent peritoneum. The left ovary was adherent by its *lateral surface* to the side of the pelvis. Both *tubes* were *patent*. The peritoneal endometriosis was situated in the peritoneum adherent to the ovary. It would seem that the endometriosis of the ovary and of the peritoneum must have had either a common origin or one was secondary to the other. Both were in a situation readily soiled by material escaping from the patent left tube. The opposite tube and ovary were normal. Another peritoneal implantation-like lesion was present in the culdesac near the left uterosacral ligament (accidental findings in resection of the sigmoid for cancer in a patient, forty-nine years old, married, but who never had been pregnant).

curs on the *lateral* and *under surfaces* of that organ and the surface containing this tissue is usually adherent to adjacent structures, such as the side of the pelvis, the posterior layer of the broad ligament or the posterior surface of the uterus. On account of these adhesions it is difficult for bits of endometrial tissue to be set free even by a menstrual reaction so that they could escape into the tubes. However, I believe that it sometimes occurs and that they may escape into the lumen of the tubes.

During the last five years I have studied the material from 293 patients with peritoneal lesions containing endometrium-like tissue. In many of these cases one and sometimes both tubes and ovaries have been removed. In nearly all of the cases, in which one or both tubes have been removed, sections of the tubes have been examined. In some only one block was cut from the tube and only two or three sections from each block were studied. In other instances two or more blocks from the tube or tubes were made and many sections were studied from each block. The purpose of these studies was threefold: (1) to detect fragments of endometrial tissue in the lumen of the tube; (2) to seek evidence of a menstrual reaction of the tubal mucosa; (3) to compare the histologic structure of the tubal mucosa with that of the associated ectopic endometrial tissue. I have encountered only three instances (Figs. 46, 53, and 55) of fragments of endometrial tissue in the lumen of tubes from these cases and all three patients

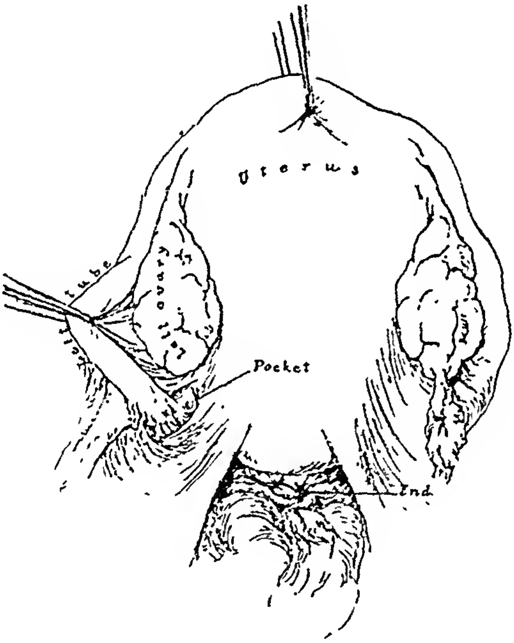


Fig. 33.—View of the pelvic contents, uterus drawn forward (x ½). The fimbriae of the left tube were lightly adherent to the posterior layer of the broad ligament. In a shallow peritoneal pocket directly beneath the ostium of the tube, the endometrial lesion shown in Fig. 34 was obtained. A small nodule (end) is situated in the culdesac. Both ovaries appeared normal and both *tubes* were *patent*. Prior to the operation the uterus was retroflexed. The patient, thirty-four years old, was married and had children.

were menstruating at the time of the operation. Blood was observed in both tubes in each instance at the time of the operation and it was apparently coming from the uterus. At the time I thought (and still believe) that the pieces of endometrial tissue in the tubes were probably carried by the blood coming from the uterine cavity, as blood escaping from the uterine cavity during curettage sometimes carries with it endometrial tissue.

Let us consider the possible sources of blood in the lumina of the tubes of patients operated upon during menstruation: (1) the tubal mucosa; (2) the uterine cavity as the result of curettage; (3) drawn into the tube through its abdominal ostium from blood in the pelvis; (4) as a back flow from blood in the uterine cavity.

Bleeding occasionally occurs during menstruation from ectopic patches of uterine mucosa in the tubal lining (Fig. 58). Should menstruating uteri be curetted prior to abdominal operations, one would expect to find blood in the lumina of the tubes in some of these cases, just as it occurs in the tubes of nonmenstruating uteri following curettage.

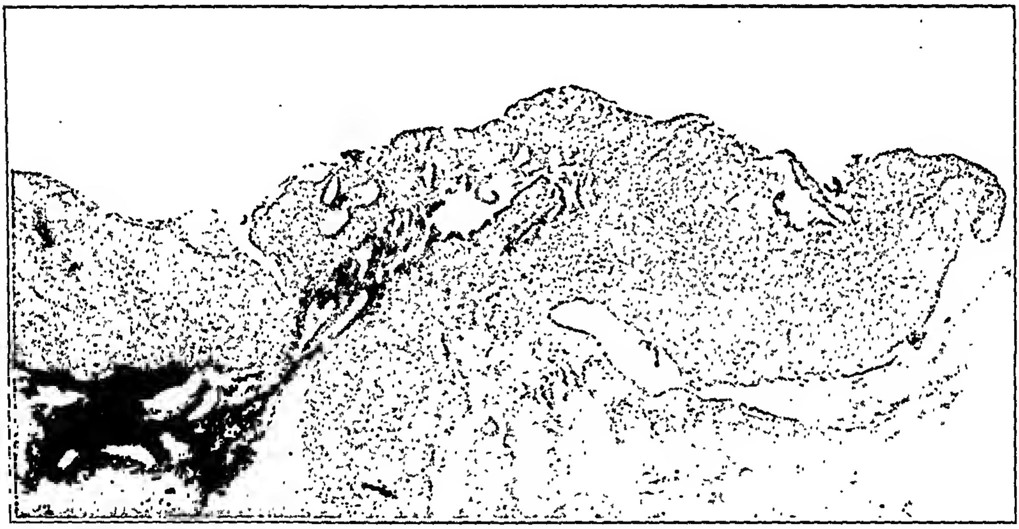


Fig. 34.—Photomicrograph (x 25) of the endometrial lesion obtained from the peritoneal pocket beneath the ostium of the adherent left tube of Fig. 33. Endometrial tissue implanted or developing on the surface of the peritoneum has invaded its deeper structures. It would seem to have arisen from material escaping from the tube. Is it an implantation of endometrial tissue or a metaplasia of the peritoneum arising from stimulation of the latter by some specific material escaping from the tube?

One would also expect that blood in the pelvic cavity from any source might be drawn into the tube through its abdominal ostium. This last year I operated upon a patient, apparently during her menstrual period. There was a large amount of blood in the pelvis and it could be seen dripping from the right tube which was only slightly larger than the opposite one. The left tube appeared normal and on stripping it blood did not escape from its ostium. The bleeding tube was removed and was found to contain the remains of a very early pregnancy. I have since examined the opposite patent tube in two other cases of tubal pregnancy and was unable to detect any blood in them. I have found it in the opposite tube when the fimbriated end has been occluded. These observations are too few to be of any great value.

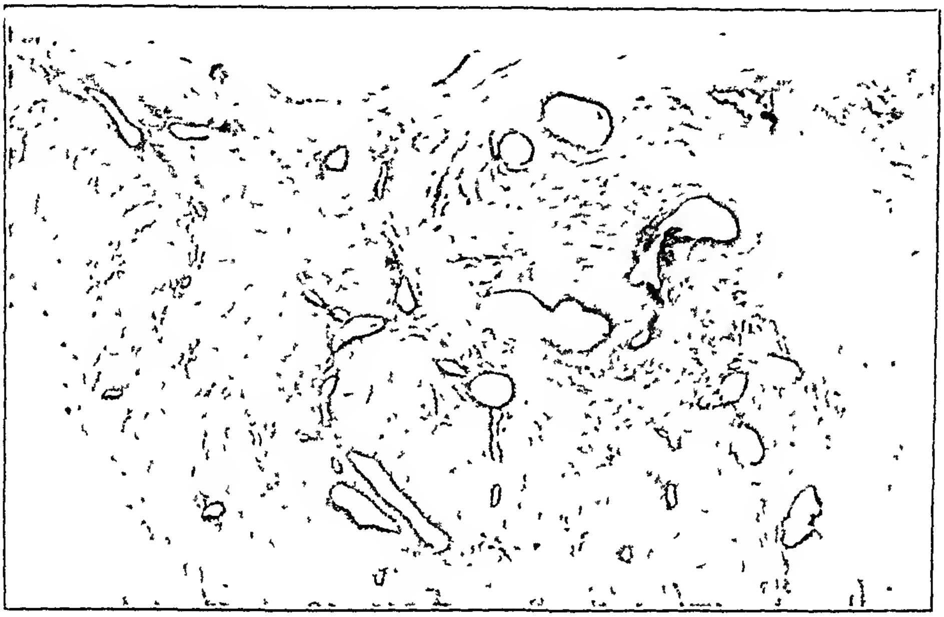


Fig 35—Photomicrograph (× 10) of the nodule removed from the culdesac of Fig 33 It is apparently an older lesion than that shown in Fig. 34. It must have arisen from an earlier implantation of endometrial tissue or an earlier specific stimulation of the peritoneal mesothelium.

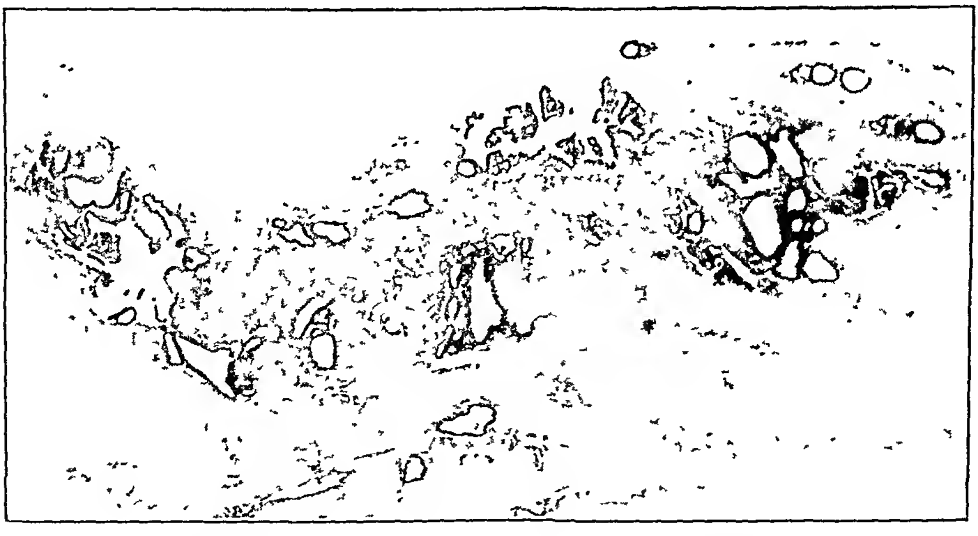


Fig. 36—Photomicrograph (× 10) of a "patch" of endometriosis in the peritoneum of the side of the pelvis, very close to the ostium of the patent left tube and directly over the ureter, as was the peritoneal endometriosis of Fig. 32. A similar lesion involved the left uterosacral ligament Both ovaries were normal and both tubes were patent The patient, forty-two years old, had children. It is an implantation-like lesion in a situation easily soiled by material escaping from the patent left tube

When blood is found at operation in the tubes of menstruating uteri and apparently is increased by compressing the uterus, this blood probably came from the uterine cavity and, at times, must carry with it bits of endometrial tissue set free by menstruation.

In four instances in which blood was observed by me, escaping from the tubes of patients operated upon during menstruation, there was no indication for the removal of the tubes other than the desire to study their contents. Blood was collected from the tubes by stripping them from the uterus towards their fimbriated end. The blood was spread on slides, dried, fixed, and stained by various methods. Epithelium-like cells were found in these preparations and also clumps of cells resembling the stroma of the uterine mucosa. There are certain valid

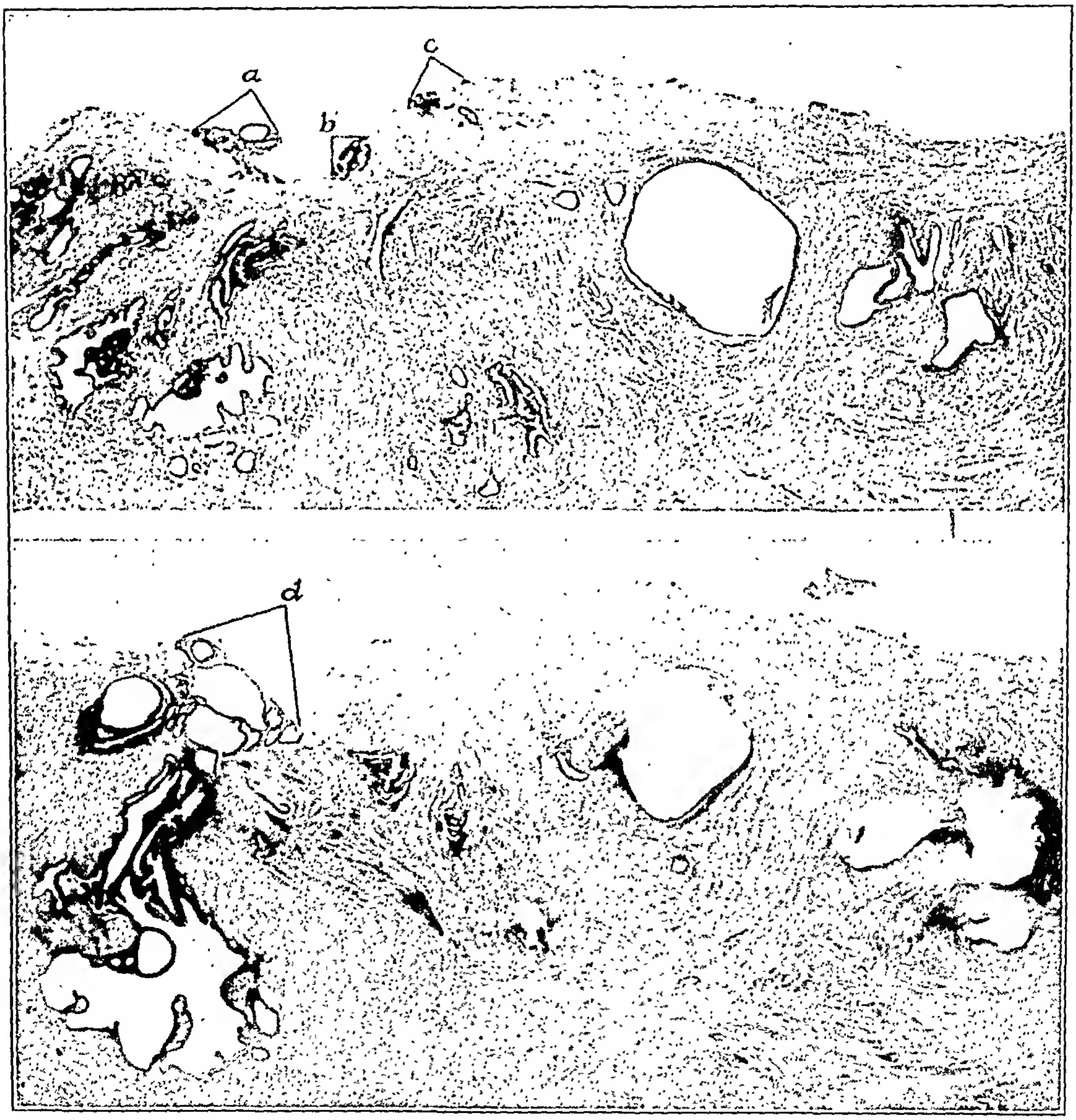


Fig. 37.—Two photomicrographs (x 10) of sections of an endometriosis of the posterior uterine wall at different levels of the same block. Typical endometrial tissue is growing on the peritoneal surface of the uterus at *a* and *b*. Lesion *a* is a part of the endometrial tissue of *d* on the peritoneal surface of the uterus shown in the lower photomicrograph. The latter apparently has invaded the deeper tissues of the uterine wall, causing a so-called adenomyoma. For a higher magnification of the lesion indicated by *c* of the upper photomicrograph, see next illustration. The patient, fifty years old, was single. The uterus was retroflexed and contained multiple leiomyomas. Both *tubes* were *patent* and both ovaries appeared normal. The left ovary was removed and endometrial tissue was not found in it. Implantation-like patches of peritoneal endometriosis were present on the posterior surface of the lower portion of the body of the uterus and in the posterior culdesac in situations easily soiled by material escaping from the patent tubes.

objections to this method. One is that trauma of stripping the tubes may dislodge some of the tubal mucosa and the other is the difficulty we (Dr. L. A. Sutton who was interested in this problem and myself) experienced in identifying the cells in these specimens. In all four cases blood was present in both tubes and in none of them was a peritoneal endometriosis present or any evident endometrial tissue on the surface of the ovaries.

In four other cases one or both tubes were removed with the uterus.

CASE I.—Peritoneal endometriosis with an adherent, retroflexed uterus. Endometrial lesions were present on the lateral surface of the ovary, the posterior surface of the uterus, and on the cecum. Blood was observed escaping from both tubes on exposing the pelvic organs at the operation. The uterus, right tube and ovary were removed. Unfortunately, the distal end of the tube was not ligated and most of the blood in the tube escaped during the manipulation of the operation. Epithelium and tissue resembling endometrial stroma were found in the lumen of the tube, adherent to the surface of the tubal mucosa. From the nature of

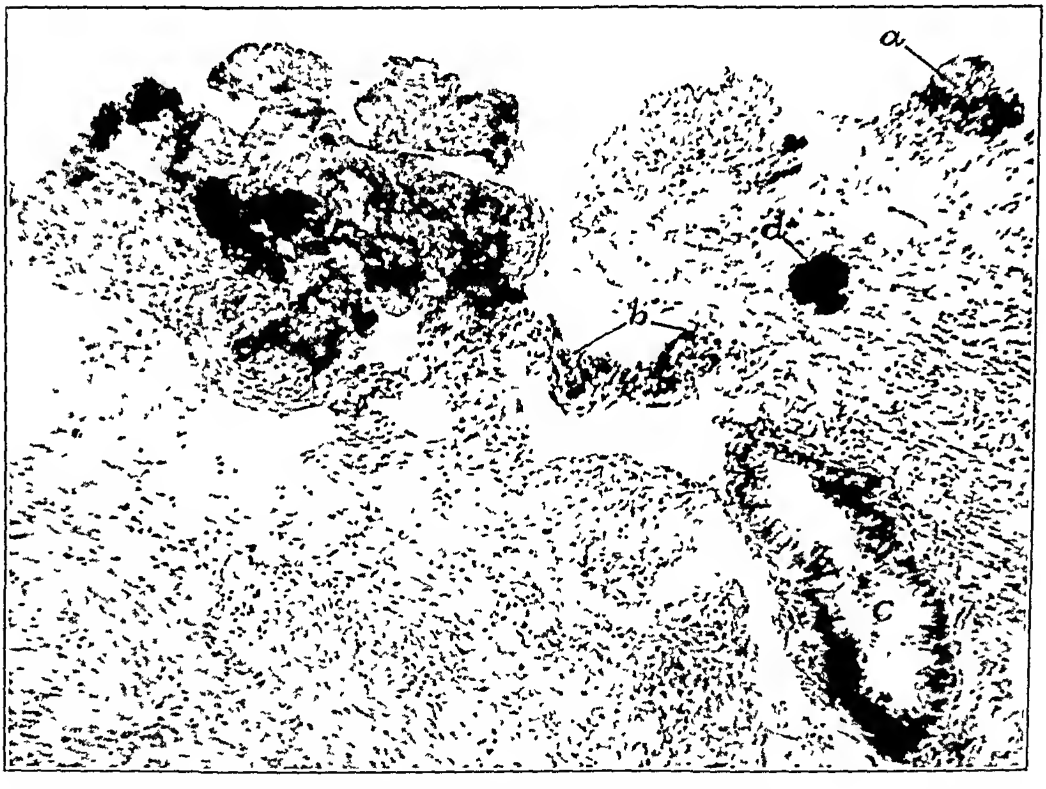


Fig. 38.—Photomicrograph (x 130) of the peritoneal lesion indicated by *c* of the preceding illustration. The surface of the uterus shows a reaction to some irritant. At *a* a piece of tissue consisting of fibrin and "dead cells" is adherent to the uterus. A larger mass of similar tissue is present to the left. At *b* endometrium-like cells have grown over or are attached to a "bridge" of newly-formed tissue. Possibly these cells were derived from similar cells in the necrotic mass above them and to the left, which had not died. Endometrial tissue *c* is becoming embedded in the uterine wall by the tissue of the latter growing over it. Lesion *d* probably represents a mass of cells which are dead. This and other sections from the same block suggest a peritoneal reaction to endometrial tissue added to (implanted on) the posterior surface of the uterus. The greater portion of this tissue in this photomicrograph is dead, but some lived (that in contact with the surface of the uterus) with a resulting endometriosis.

the peritoneal lesions and those in the ovary I do not believe that endometrial tissue in the tube could have come from these (Figs. 51, 52, and 53).

CASE 2.—Retroflexed uterus containing multiple small leiomyomas. On exposing the pelvic organs at operation blood was observed escaping from both tubes and apparently coming from the uterus. Two small hemorrhagic blebs were present on the under surface of the left ovary. Blood was not observed escaping from these. The fimbriated ends of both tubes were first ligated and also the uterine end of the right tube, then the uterus, left tube and ovary, and right tube were removed. This case was reported in a previous article.[9] Strips of epithelium, a gland, and fragments of endometrial stroma mixed with blood were found in the lumen of one of the tubes. These were identical in their structure and staining reaction with those present in the mucosa of the uterus from which a large amount of tissue had been cast off by menstruation. The ovarian lesion consisted of two small blebs lined by epithelium of endometrial type with very little stroma and no glands. In places a small amount of the epithelial lining had been cast off by an apparent menstrual reaction or from the trauma of the operation, but not enough to account for that present in the tube nor did it resemble this as closely as did the mucosa lining the uterine cavity. The blood in the tubes was apparently coming from the uterus and carried with it endometrial tissue. It might be claimed that the endometrial tissue was forced into the tubes by the manipulation of the uterus during the operation, but blood was in the tubes prior to the handling of the uterus (Figs. 54, 55, and 56).

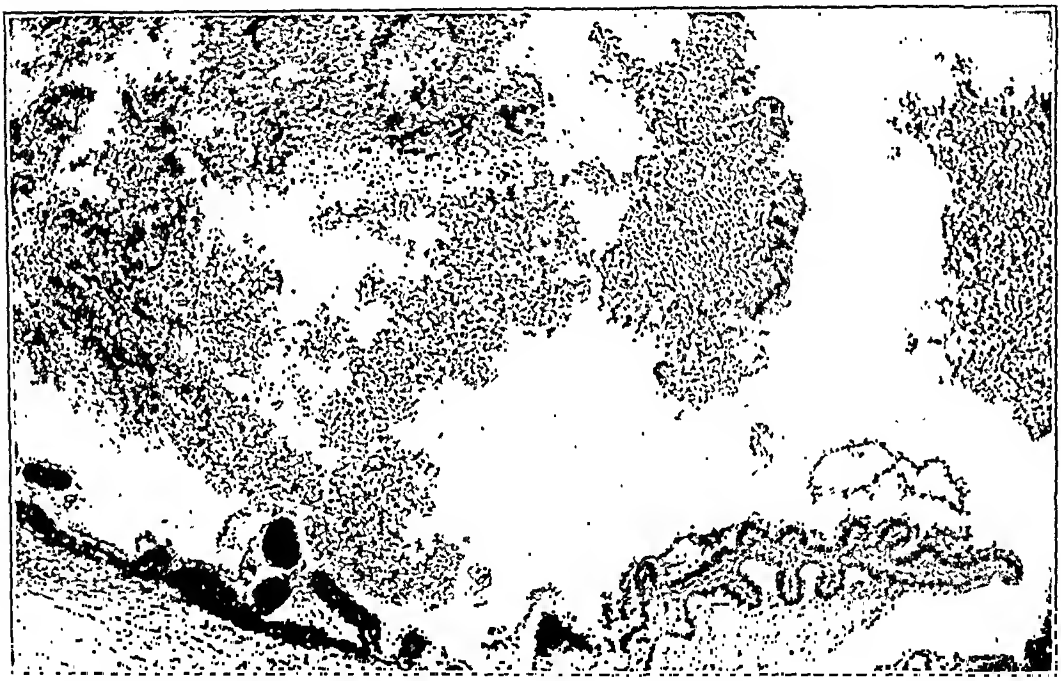


Fig. 39.—Photomicrograph (x 60) showing endometrial tissue free in the lumen of the tube due to an "artefact." Since bits of endometrial tissue floating about in the embedding solutions easily lodge in the empty vessels of blocks of the uterine wall carried through these solutions (see Figs. 19, 20 and 21 of previous article[2]), similar scraps in these solutions might find a "block" of the ampulla of the tube a very convenient "basket" in which to drop. Bits of endometrial tissue and barium sulphate were purposely placed in the embedding solutions through which "blocks" of the tubes were being carried and these were found in sections of the tubes. In a study of endometrial or any other foreign tissue in the lumen of the tube an artefact should be considered, and, if possible, eliminated.

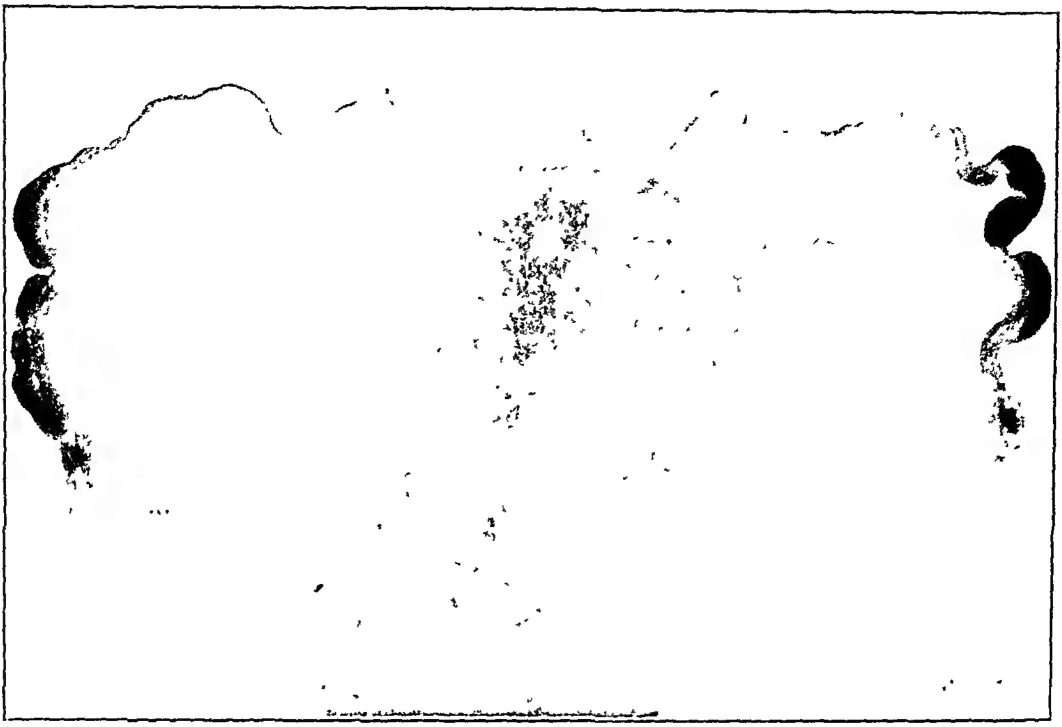


Fig. 10.—Roentgenogram (x ¾) of the uterus, tubes, and ovaries after filling the uterine cavity with gelatine containing bismuth subcarbonate. The mass readily escaped from the uterine cavity into the tubes. The uterus, tubes, and ovaries were removed for uterine bleeding due to myofibrosis (illustration published[7] in 1918). The interstitial portions of the tubes appear as mere threads, but even so, small bits of endometrial tissue might be carried into the tubes by blood escaping from the uterine cavity during curettage and menstruation (see Fig. 42). The specimen was hardened in formalin, before taking the roentgenogram, which would narrow the lumen of the tube. The uterus was placed, anterior surface downward, on a piece of waxed cardboard, beneath which was the photographic plate in two light-proof envelopes. Therefore, the distance from the tubes to the photographic plate was short. This would cause only a slight enlargement of the apparent lumen of the tube, possibly not compensating for the shrinkage due to hardening the specimen.

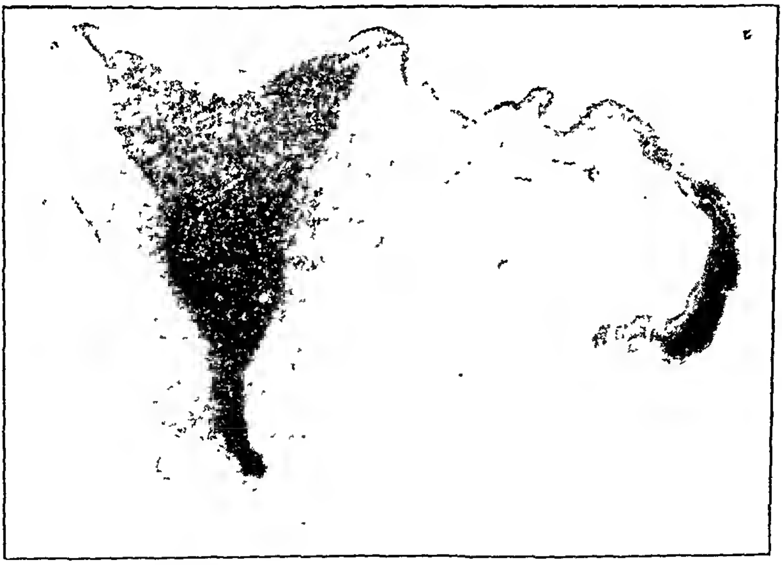


Fig. 11.—Roentgenogram (x ⅔) similar to the preceding. The uterus and one tube and ovary were removed for multiple small uterine leiomyomas. The lumen of the interstitial portion of the tube is much greater than that of the preceding specimen, and therefore, larger bits of endometrial tissue could pass from the uterine cavity into the tubes than in the former. Illustration also published in 1918, in the legend of which I suggested that menstrual blood, at times, might escape through the tubes into the peritoneal cavity. Note the normal construction of the distal end of the tube at the origin of its fimbriae, also shown in the preceding specimen.

Case 3.—Leiomyoma of the uterus. On exposing the pelvic organs at operation blood was observed escaping from both tubes. Endometrial tissue was present on the lateral surface of the left ovary which was adherent to the posterior surface of the uterus. A small patch of endometrial tissue was present on the posterior surface of the uterus mesial to the left ovary. The distal ends of both tubes were ligated and then the uterus, both tubes, and ovaries were removed. Bits of endometrial tissue were found embedded in blood in the lumen of the tubes, which were identical in their structure with fragments of the uterine mucosa present in blood obtained from the uterine cavity. The endometrial tissue on the surfaces of the ovary and the uterus showed the same reaction to menstruation as did the mucosa lining the uterine cavity. I cannot exclude the possibility that blood, carrying with it endometrial tissue, had escaped into the abdominal ostia of the tubes from the menstruating endometrial tissue on the ovary and the uterus. From observations made at operation it appeared that the blood in the tube came from the uterine cavity. It was present in both tubes. The endometrial lesions on the surface of the left ovary were small and that aspect of the ovary was adherent to the uterus, thus lessening the chance of endometrial tissue escaping (see Figs. 43, 45, 46, 48, 49, and 50).

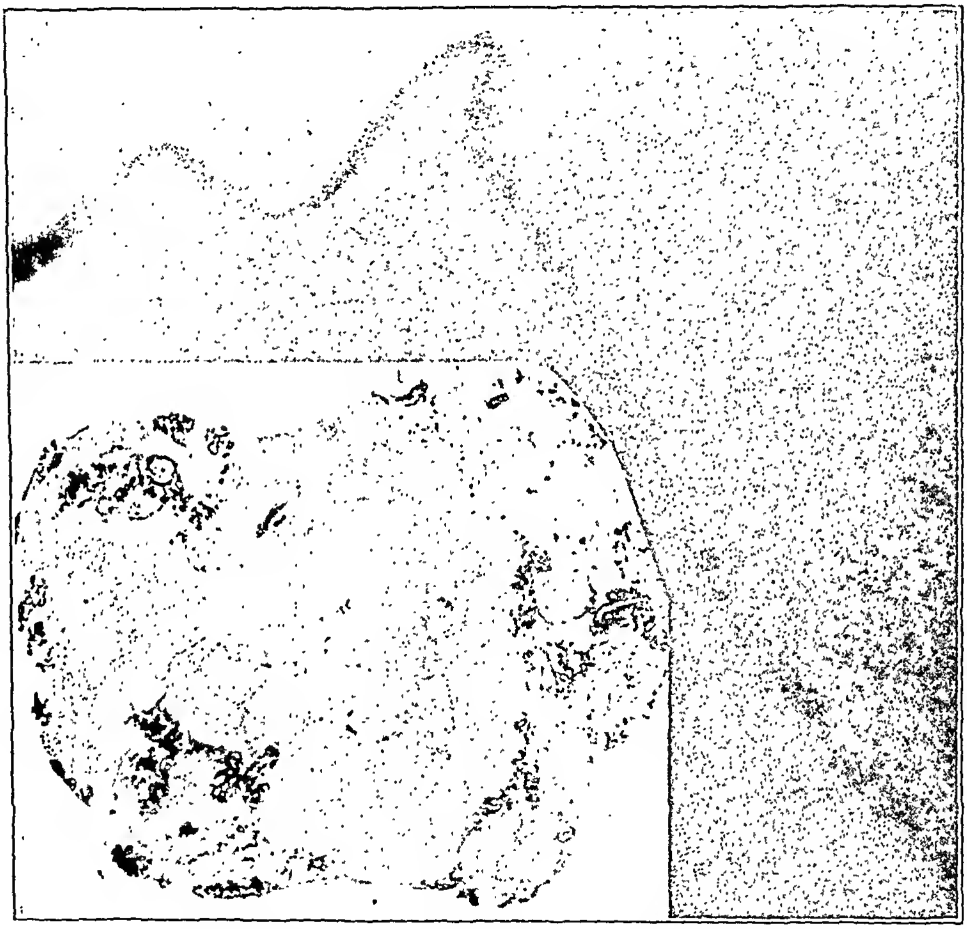


Fig. 42.—Photomicrograph (x 10) of a section of menstrual blood from the cavity of the uterus shown in the next illustration, placed beside an enlargement (x 10) of the very narrow thread-like interstitial portion of the tube shown in the roentgenogram of Fig. 40. The smaller bits of the uterine mucosa in this blood would easily pass through the lumen of the tube and the larger pieces would readily pass through a tube of greater caliber as the tube of the roentgenogram of Fig. 41. Blood escaping from the uterine cavity into the tubes during curettage and menstruation, at times, might carry with it bits of the uterine mucosa suspended in that blood (Fig. 46).

CASE 4.—Submucous leiomyoma of the uterus. On exposing the pelvic organs at operation blood was observed escaping from both tubes and apparently coming from the uterus. Peritoneal endometriosis was not present, nor was there any evidence of endometrial tissue on the surface of the ovaries. The fimbriated end of the left tube was ligated and the left tube and ovary and uterus were removed. A clump of epithelium-like cells, which I was unable to identify, was found in the lumen of the tube but no endometrial stroma. A mitotic figure was present in one of these cells (Fig. 57). I was unable to find any mitotic figures in epithelial cells in the blood obtained from the uterine cavity.

I fully realize that it is impossible definitely to state the origin of the blood in the lumen of the tubes in these eight cases. In all instances the blood was observed in the tubes of menstruating uteri prior to the operative manipulation of that organ and if it came from the uterine cavity, as it apparently did, we know that it may carry with it bits of endometrial tissue. We should also expect that this endometrial tissue would be as capable of becoming implanted in suitable situations as that escaping into the venous circulation of the uterus and vagina and that escaping into the peritoneal cavity from ectopic endometrial foci in the pelvis.

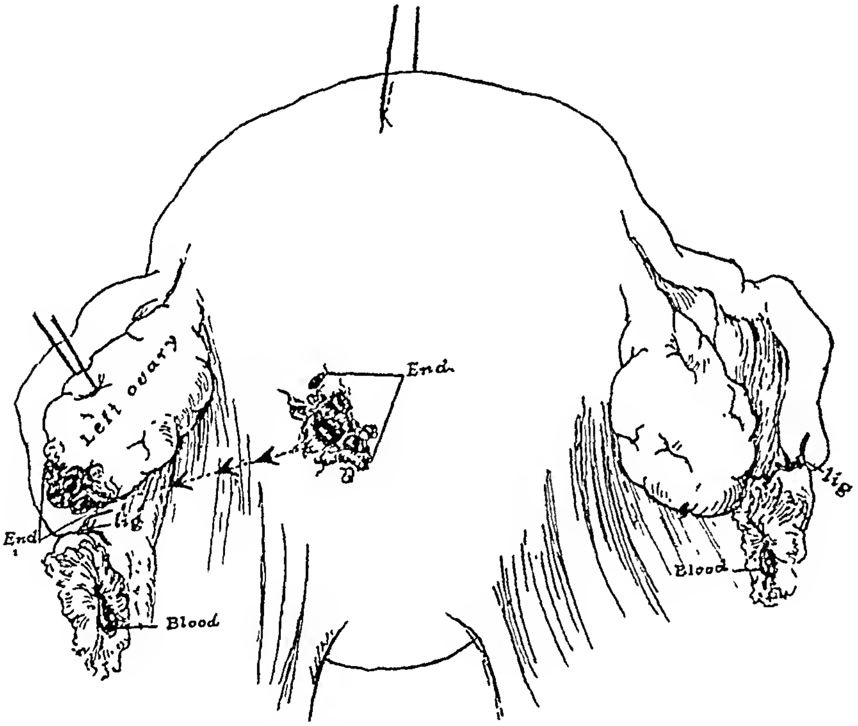


Fig. 43.—Myomatous uterus, tubes and ovaries drawn upwards (x ⅔). (Case 3 of this article.) The patient, forty-nine years old, married and having had children, was operated upon during menstruation. The left ovary (freed and lifted up) was adherent by its *lateral* and *under surfaces* to the posterior uterine wall, due to an endometriosis of the ovary (Fig. 48). A patch of endometrial tissue (Fig. 49) is present on the posterior uterine wall adjacent to the area to which the ovary had been adherent. Blood was observed coming from the abdominal ostia of both tubes. The distal ends of both tubes were first ligated in order to retain their contents, and then the uterus, tubes, and ovaries were removed. Did the blood in the tubes come from the uterine cavity or were the tubes disgorging blood obtained from the menstrual reaction of the misplaced endometrial tissue on the surface of the uterus and the lateral and under surface of the left ovary, the latter having been adherent to the uterus? Blood was present in *both tubes* and apparently was coming from the uterus and I believe that was its origin.

THE LESIONS OF PERITONEAL ENDOMETRIOSIS OFTEN OCCUR IN SITUATIONS AND UNDER CONDITIONS INDICATING THEIR ORIGIN FROM MATERIAL ESCAPING INTO THE PERITONEAL CAVITY

One of the outstanding features of patients with peritoneal endometriosis is that the tubes are usually patent. In 293 cases of peritoneal lesions containing endometrium-like tissue encountered during the last five years both tubes appeared to be patent in 284, a unilateral hematosalpinx in three (in two of these blood was present in the opposite tube but the tube was patent), bilateral hematosalpinx in four, and bilateral pyosalpinx in two. Patent tubes apparently increase the incidence of peritoneal endometriosis and possibly the relatively large number of patients with hematosalpinx (seven) may be of some significance. In the six cases with occlusion of both tubes, the peritoneal lesions might have been present prior to the closure of the fimbriated ends of the

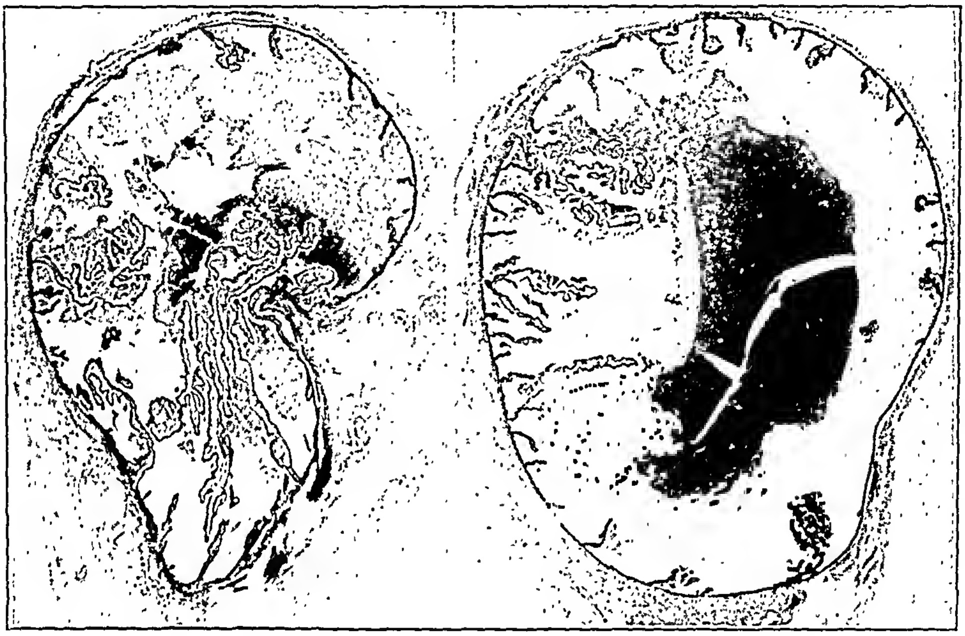


Fig. 44.—Photomicrograph (x 6) of a cross-section of the ampulla of a tube containing blood and bits of endometrial tissue (Fig. 46), carried with that blood from the uterine cavity during curettage. The abdominal operation had been preceded by a curettage of the uterus and repair of the pelvic floor. On exposing the pelvic contents, blood was observed dripping from the abdominal ostia of both tubes. I had planned to sterilize the patient. One tube was removed after ligating its distal end, so as to retain its contents. This tube was fixed in formalin. The opposite tube was cut at its uterine end and the stump buried. The bits of endometrial tissue (Fig. 46) floating about in blood in the lumen of the tube must have passed through its interstitial portion. Therefore, similar bits of endometrial tissue might be carried into the tube by menstrual blood escaping from the uterine cavity (Fig. 46).

Fig. 45.—Photomicrograph (x 6) of a cross-section of the ampulla of one of the tubes shown in Fig. 43. It contains blood and small bits of endometrial tissue, possibly carried with blood from the uterine cavity during menstruation, just as blood escapes from the uterine cavity into the tubes during curettage (Figs. 44 and 46). The ligated tubes, hardened in formalin, were cut into blocks and many sections were made from each block. Bits of endometrial tissue were found in sections from two different blocks. Unfortunately, the blocks removed from both tubes were run through the embedding solutions together and I was unable to determine whether the endometrial tissue was found only in one tube or in both. Blood was present, however, in both tubes.

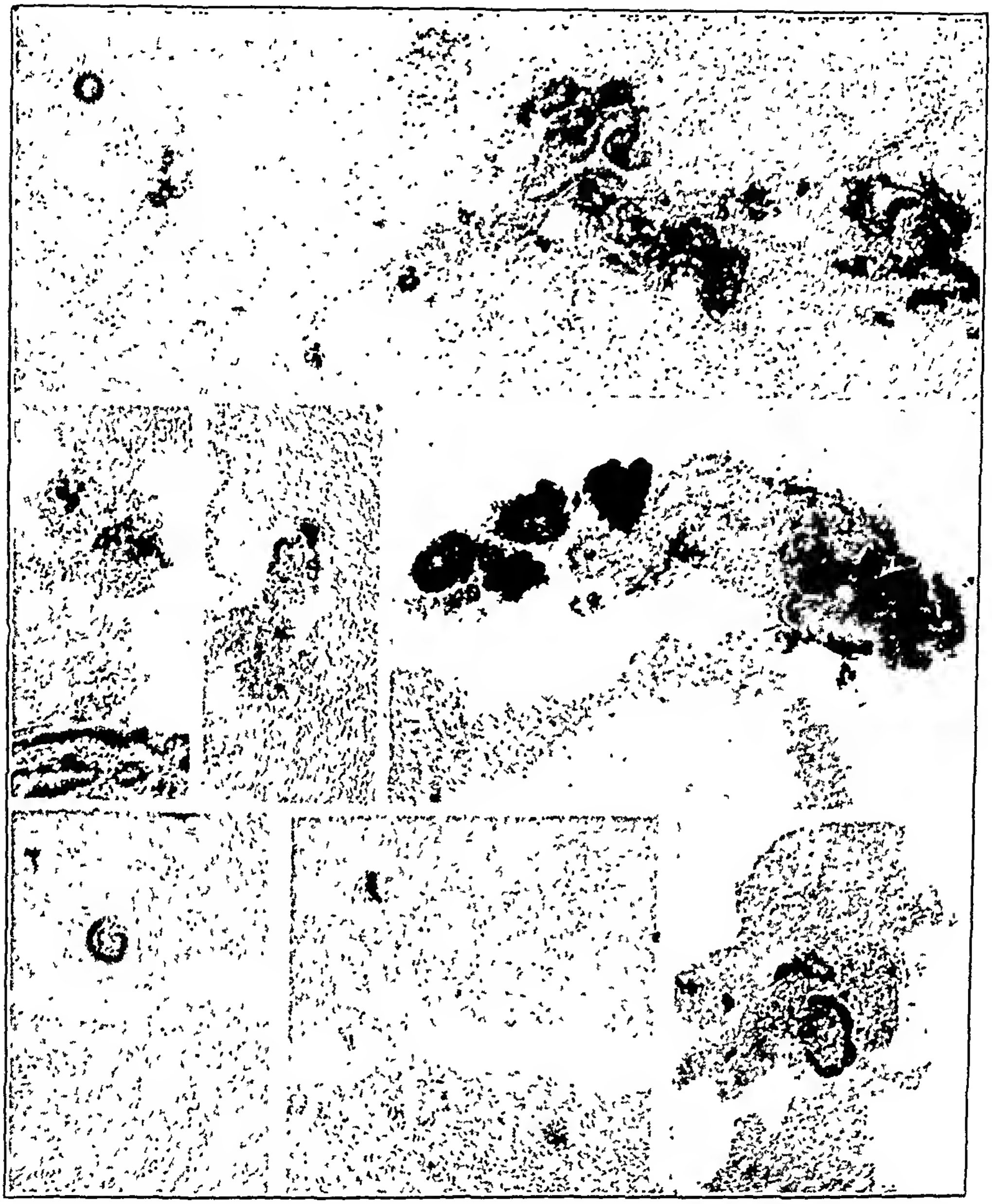


Fig. 46.—Seven photomicrographs (x 60), the lower three are from sections of the tube shown in Fig. 44 containing blood which had escaped from the uterine cavity during curettage. Bits of uterine mucosa are present in the blood and must have been carried with the latter through the interstitial portion of the tube.

The upper photomicrograph is of the section of the blood from the cavity of the menstruating uterus shown in Fig. 43. Blood apparently coming from the uterus was present in both tubes. Did the blood and endometrial tissue in these tubes come from the uterine cavity or from the menstruating ectopic endometrial tissue on the surface of the left ovary and adjacent surface of the uterus (Fig. 43, 48, 19, and 50)?

The middle three photomicrographs are from three different sections of the tube or tubes shown in Figs. 13 and 45. The first two photomicrographs show bits of endometrial tissue (epithelium and stroma) similar to those in the photomicrograph of the blood from the uterine cavity (above) and also those carried into the tubes during curettage (below). This suggests that they came from the uterine cavity but does not prove it. Both blood and endometrial tissue might escape into the tubes from the menstruating endometrial tissue on the surface of the ovary and the uterus (see Figs. 48, 49, and 50). The largest of the three middle photomicrographs shows a curved, elongated, "moulded" mass consisiting of bits of endometrial tissue and fibrin. Should the endometrial tissue in the photomicrogrpah above it be forced into a narrow, curved tube, it would be moulded or fashioned into a mass like this. I believe that this moulded mass represents a cast of the lumen of a narrow portion of the tube and adds to the evidence already presented that the endometrial tissue in the tube or tubes was derived from the uterine cavity. The manipulation of the uterus during the operation may have forced endometrial tissue and blood from the uterine cavity into the tubes and dislodged this endometrial "plug." This is probably true Blood was, however, observed escaping from the tubes before the uterus was handled.

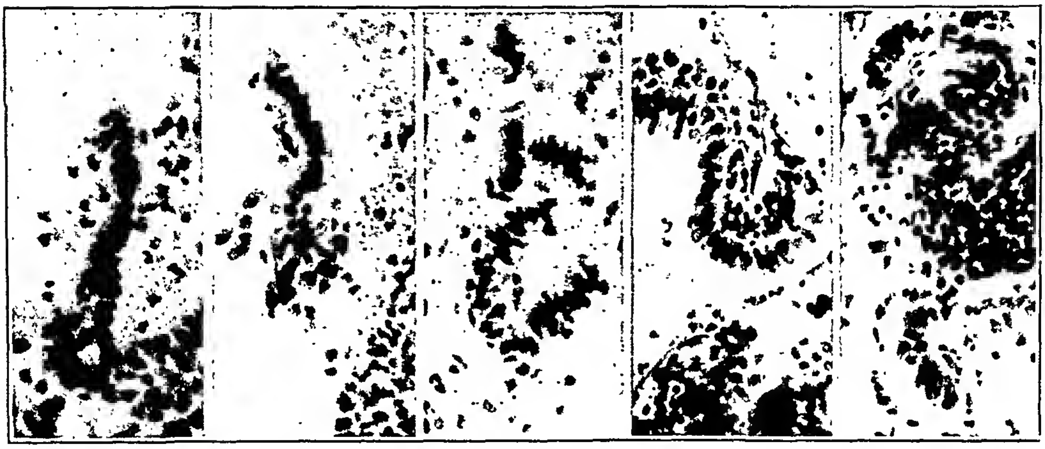
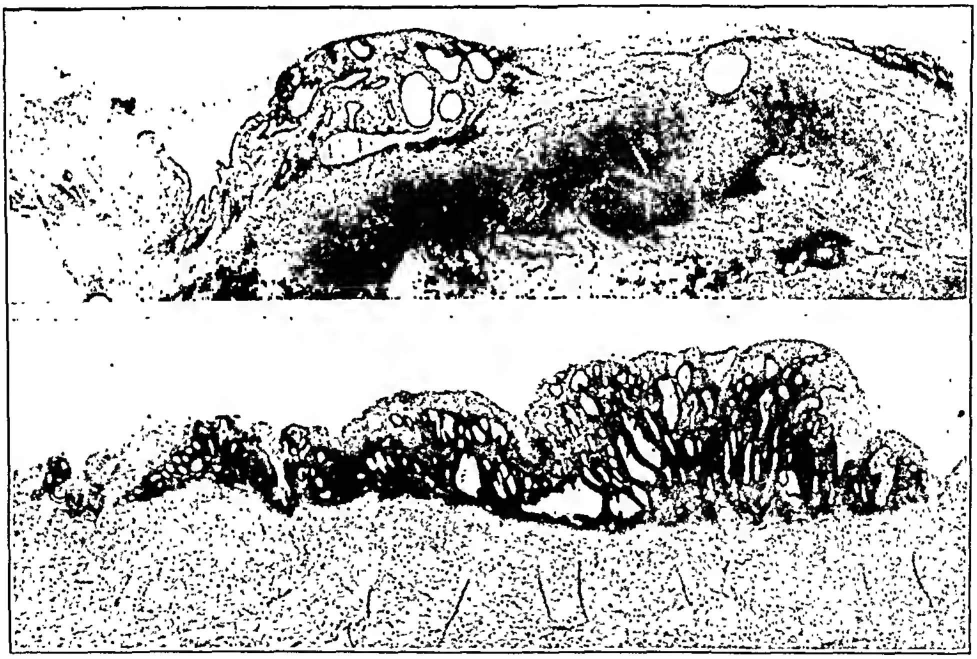


Fig. 47.—Five photomicrographs (x 250), the first two are of menstrual blood obtained from the vagina of two different patients. The third is from blood obtained from the uterus in curettage. The uterine epithelium in the first two appears just as healthy and just as much alive as that in the third. The fourth is from the menstrual blood of the uterine cavity (Case 3). The uterine epithelium stains as sharply as that in the third. The fifth is of a portion of the endometrial "cast" found in the tube of Case 3 and shown in Fig. 46. Epithelium, in the upper and lower ends of this photomicrograph, would seem to be alive. I have purposely photographed the healthiest appearing endometrial tissue that I could find in menstrual blood, the very kind I would choose to sow were I cultivating (implanting) this tissue.



Figs. 48 and 49.—Two photomicrographs (x 10), one of the endometriosis on the surface of the left ovary and the other of the endometriosis on the surface of the uterus adjacent to the ovary. Both are of the same structure and of the same apparent age. They must have had either a common origin or one must have been secondary to the other. They are in a situation (Fig. 43) readily "soiled" by material escaping from the abdominal ostium, of the patent left tube.

tubes. It would seem that during the menstrual life of women some substance escapes from the tubes into the pelvis which plays an important rôle in the etiology of pelvic peritoneal endometriosis, including the development of endometrial tissue on the ovaries. This substance may be menstrual blood in some instances and tubal secretions in others.

In either case epithelium may be present. Endometrial tissue on the ovary nearly always occurs on the *lateral* and *under surfaces* of that organ. These surfaces are usually in contact with the side of the pelvis, the posterior layer of the broad ligament, or the posterior surface of the uterus, thus forming a crevice between the ovary and these structures which would favor the retention of any material escaping from the tubes into the pelvis. In freeing the ovary containing an endometrial hematoma, the wall of the hematoma is usually torn or reopened at the site of a previous perforation of the cyst or where the endometrial tissue in the ovary first developed. The tear in the cyst caused by the operation is nearly always on either the *lateral* or *under surface* of that structure.

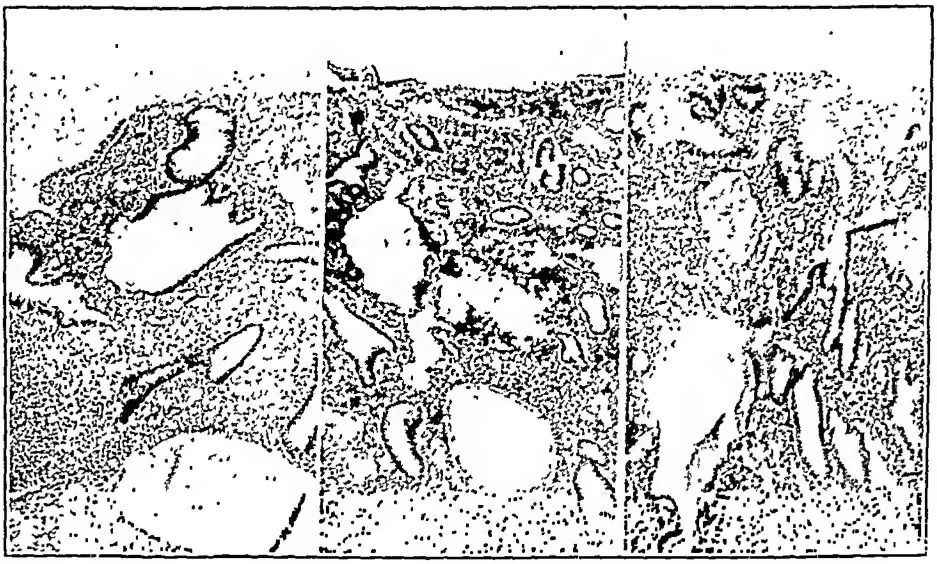


Fig. 50.—Three photomicrographs (x 40), the first of the endometrial tissue on the surface of the left ovary, the second of the uterine mucosa, the third of endometrial tissue on the surface of the uterus (Fig. 43). The histologic structure of all three is the same and they all show the same reaction to menstruation. As blood carrying with it bits of endometrial tissue escapes from the mucosa of the uterine cavity during menstruation, so might it likewise escape from these ectopic endometrial foci. Theoretically, it is possible that the blood in the tubes may have come from this source. It was, however, present in both tubes, was apparently coming from the uterus, and contained bits of endometrial tissue identical with those found in the blood of the uterine cavity. In addition, a moulded mass of endometrial tissue was found in this blood which conformed to a cast of the interstitial portion of the tube, through which it had apparently passed (Fig. 46).

Peritoneal endometriosis occurs most frequently in situations in the pelvis easily soiled by material escaping from the tubes and ovaries. It would seem that the tubes and ovaries are the chief distributing agents for the cause of pelvic peritoneal endometriosis. It is not peculiar to the pelvic peritoneum, as the appendix, cecum, small intestine and their mesenteries may be involved. The posture of mankind, whether standing, sitting, or lying down appears to be an important factor in determining the distribution of these lesions.

A comparative study of the lesions of peritoneal endometriosis with those of peritoneal carcinosis of implantation origin demonstrates that the peritoneal reaction is the same in both instances. Endometrial tissue and cancer may grow on the surface of the peritoneum. Both may become embedded in the peritoneum by the tissues of the latter growing over them. Both may be included in mesothelial lined pockets and may be caught in adhesions.

THE ETIOLOGY OF ENDOMETRIUM-LIKE TISSUE IN THE OVARY

The endometrial tissue in a direct or primary endometriosis of both uterine and tubal origin shows a variety of lesions, such as typical endometrium with glands and stroma identical with that of the müllerian mucosa from which it came, and also dilated glands or cyst-like cavities lined by epithelium with very little or no characteristic endometrial stroma about it.

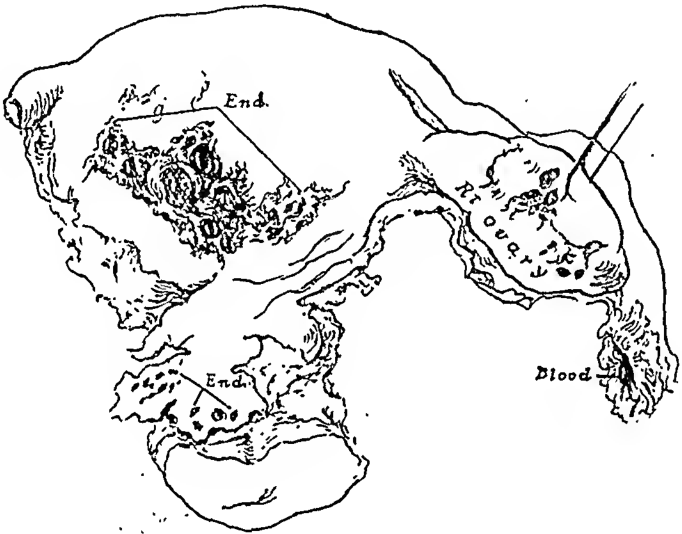


Fig. 51.—Posterior surface of the uterus, right tube and ovary (x ⅔), Case 1 of article. Uterus was retroflexed, and operation was performed on the second or third day of menstruation. Blood was observed escaping from both tubes on exposing the pelvic organs. Unfortunately, the distal end of the tube was not ligated and most of the blood in the tube was lost during the manipulation of the operation. Endometrial tissue was found in the tube (Fig. 53). Could the blood and the endometrial tissue in the tube have come from the ectopic endometrial tissue of the ovary and the posterior surface of the uterus? The endometrium-like tissue of the *lateral surface* of the ovary consisted of dilated glands filled with blood without any evidence of rupture. The endometriosis of the posterior uterine wall (Fig. 52) consisted of granulation tissue on its surface with deposits of endometrial tissue enmeshed in it and similar foci of endometrial tissue in the superficial portion of the uterine wall. Exposed endometrial tissue on the surface of the pelvic organs was not found. The endometriosis of the lateral surface of the ovary and the uterus are in situations readily soiled by material escaping from the tubes.

Marked changes in the mucosa lining the uterine cavity often occur. Of particular interest are those in the mucosa over a submucous leiomyoma. This mucosa becomes thin, the glands disappear, the stroma becomes less and less and in extreme cases the submucous leiomyoma is covered by a mucosa not unlike the mesothelial covering of a subserous leiomyoma. The endometrial epithelium in unfavorable conditions may be very similar to the peritoneal mesothelium and the surface epithelium of the ovary. Both the peritoneal mesothelium and the surface epithelium of the ovary, under the stimulation of any irritant, may become hypertrophied and resemble the epithelium of the uterine mucosa. We recognize the mucosal covering of a submucous leiomyoma to be of endometrial origin, even though it simulates the peritoneal mesothelium and the epithelial lining of a follicular cyst of the ovary. When we find patches of typical endometrial tissue in an ovarian cyst with a lining similar to the mucosal covering of a submucous leiomyoma, can it be truthfully said that the typical endometrial tissue represents a metaplasia of the epithelium of a follicular cyst of the ovary, just because the cyst is situated in the ovary and portions of its lining resemble that of a follicular cyst? Is it not more logical to claim that the entire cyst is lined by one kind of tissue and that endometrial, portions of which have failed to attain their full growth, and thus present a histologic picture identical with the linings of some of the atypical endometrial cavities of a direct endometriosis and the mucosal covering of submucous leiomyomas? See Figs. 59 and 60.

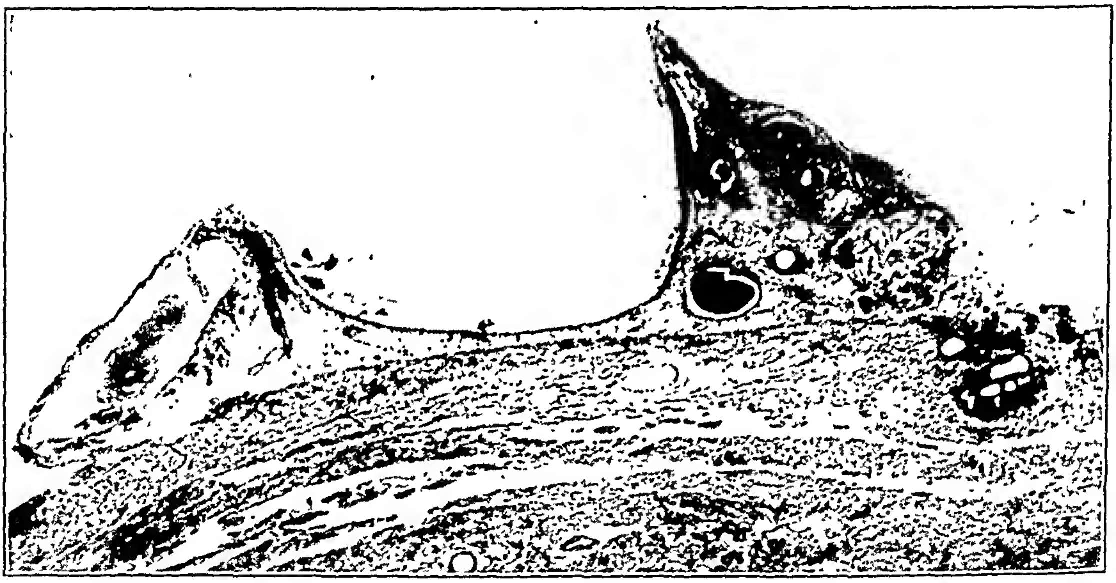


Fig. 52.—Photomicrograph (x 10) of a portion of the endometriosis of the posterior uterine wall. Granulation tissue, evidence of a reaction of the peritoneum to some irritant, has developed on the posterior surface of the uterus and has included in it endometrial tissue, just as cancer of implantation origin is included in the granulation tissue of peritoneal carcinosis. Endometrial "pockets" are also present in the superficial portion of the uterine wall. If this lesion is of implantation origin, it hardly could have come from the ovary. It is apparently an older lesion and could well be explained by the reaction of the peritoneum to material escaping from the tube; this material might contain uterine or tubal epithelium.

On account of the faculty of known endometrial epithelium to simulate peritoneal mesothelium and the surface epithelium of the ovary, it is often difficult to determine the origin of all misplaced endometrium-like tissue in the ovary.

Because a variety of epithelial structures develop in the ovary, it is natural to believe that müllerian tissue might also develop in that organ. Even if endometrial tissue arises on and in the ovary from the implantation of endometrial and tubal tissue on that organ, as I believe it does, this does not exclude the origin of similar tissue from other sources.

THE ETIOLOGY OF PERITONEAL ENDOMETRIOSIS

I have stated in this article that I have encountered 293 patients with these lesions in the last five years. The question arises: are all these instances of true peritoneal endometriosis? I cannot prove this. In

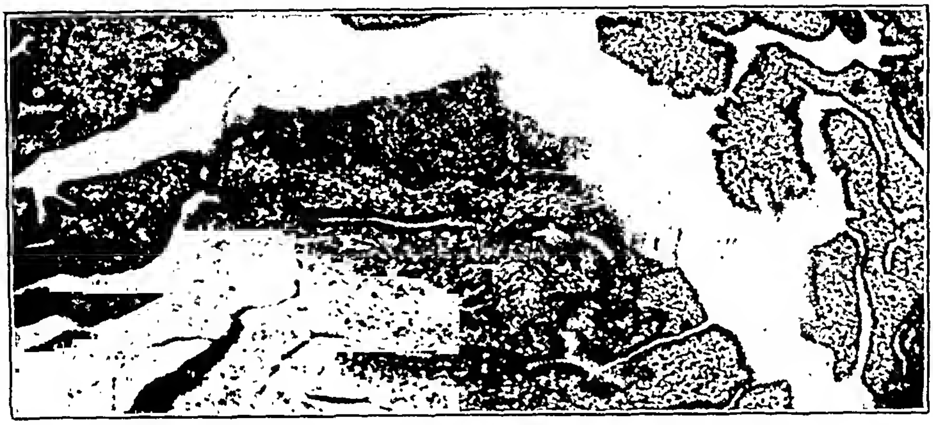


Fig. 53.—Photomicrograph (x 60) of a portion of the cross-section of the tube of Case 1. Endometrial tissue, consisting mostly of stroma infiltrated with blood and some epithelium, is adherent to the surface of the tubal mucosa. (The section unfortunately is thick.) This endometrial tissue resembled similar bits in the blood of the uterine cavity, from which the blood in the tubes was apparently coming.

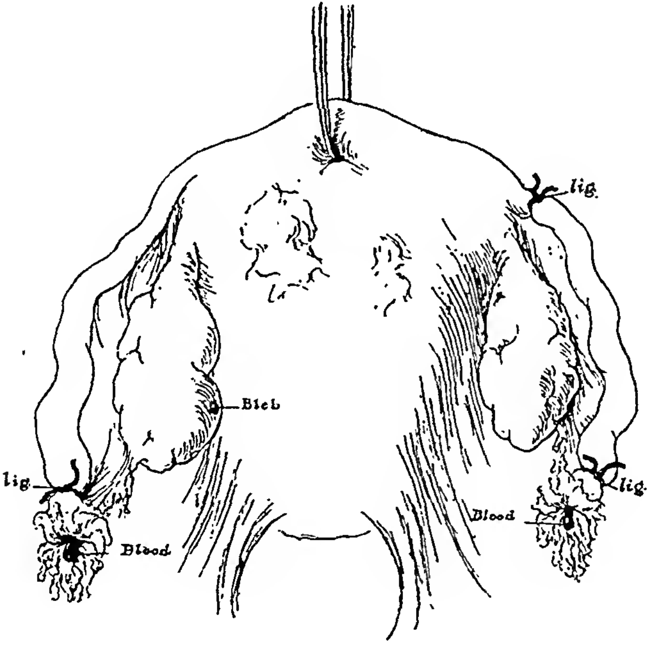
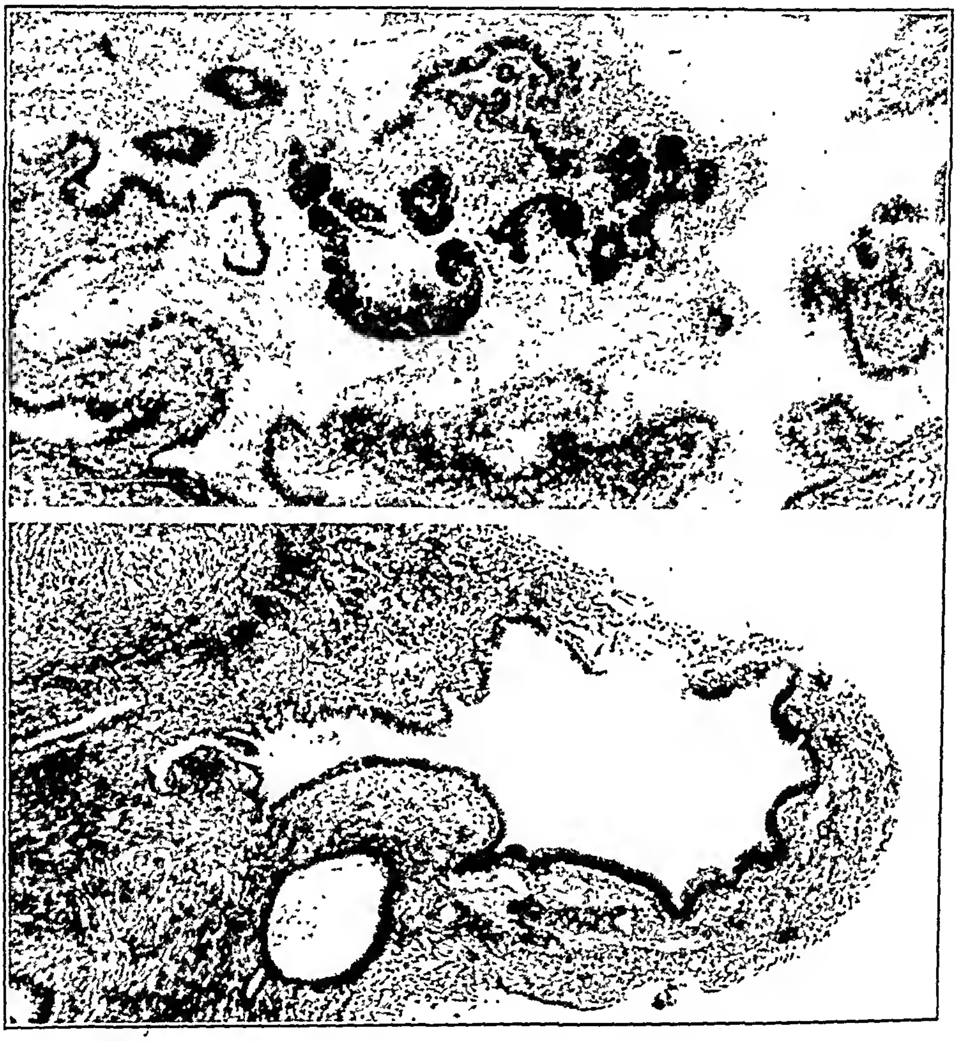


Fig. 54.—Uterus, tubes, and ovaries (x ½) of Case 2. The patient was menstruating at the time of the operation and blood could be seen coming from the abdominal ostia of both tubes. The distal end of the left tube and both the distal and proximal ends of the right tube were ligated before removing the uterus. The uterus, left tube and ovary, and the right tube were removed and hardened in formalin. Sections from both tubes showed blood and epithelial cells, a greater amount in the left tube as would be expected, because its proximal end, unfortunately, had not been ligated. Two small hemorrhagic blebs were found on the *under surface* of the left ovary, only one shown in the illustration. For the contents of the left tube and the structure of the larger bleb on the surface of the ovary, see Figs. 55 and 56.

many, typical endometrial tissue was found with a histologic structure identical with that of the mucosa of the uterus. In others, only atypical endometrial tissue was present, but similar to that often encountered in an endometriosis arising from the invasion of the uterine wall by its mucosa and by that of the tube. In still others, both typical and atypical endometrial tissue was found and one could trace the transition of one type of lesion into the other, just as one can follow a similar transition in the endometrial lesions of a direct endometriosis.



Figs. 55 and 56.—Two photomicrographs (x 60), the first of a portion of a cross-section of the left tube containing blood, strips of epithelium, a "gland" and fragments of *endometrial stroma* identical in structure and staining reaction with those present in the mucosa of the uterus, from which a larger amount of tissue had been cast off by menstruation. Compare with the ovarian lesion shown below. The endometrial tissue might have been forced into the tube during the operation, as the uterine end of the tube had not been ligated. Blood, however, was present in both tubes prior to the handling of the uterus.

The second photomicrograph (x 60) is of a section of the larger hemorrhagic bleb on the surface of the left ovary (Fig. 54). It is lined by epithelium of endometrial type with very *little stroma* and no *glands*. I was unable to find the loss of sufficient tissue to account for that in the tube, nor did the endometrium-like tissue of the ovary resemble that in the tube as closely as the mucosa lining the uterine cavity resembled it. It does not seem possible that the blood in the tubes (both) came from the small blebs on the left ovary (see Fig. 54).

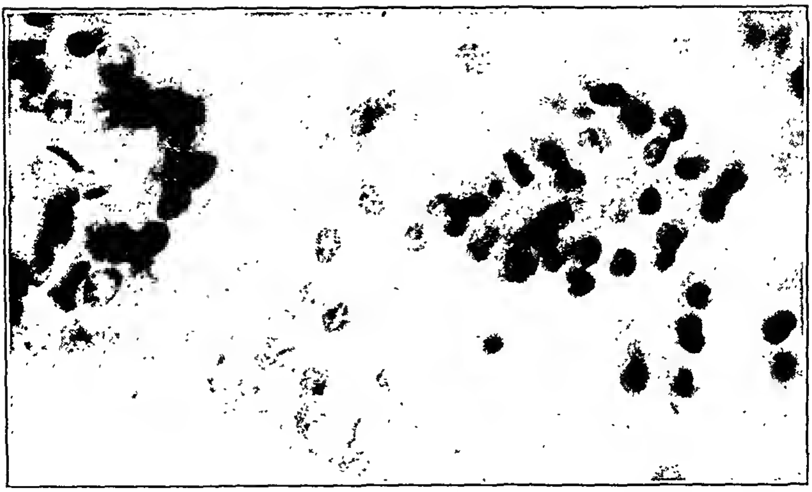


Fig. 57.—Photomicrograph (x 600) of a clump of epithelium-like cells in the lumen of the tube of a menstruating uterus (Case 4). Blood was observed escaping from the abdominal ostia of both tubes and apparently coming from the uterus. Peritoneal endometriosis was not present nor was there evidence of endometrial tissue in the ovaries. A clump of epithelium-like cells (to the right) is shown, surrounded by blood, in the lumen of the tubes. A mitotic figure is present in one of these cells. I am unable to state their origin. They certainly are not constituents of normal blood and they very closely resemble epithelium. Compare with the epithelium of the tubal mucosa to the left. Bits of uterine mucosa and clumps of epithelial cells were found in the blood obtained from the uterine cavity, but mitotic figures were not seen. If these are epithelial cells from the uterine or tubal mucosa they were alive at the time of the operation.

In four other cases blood was observed in the tubes of menstruating uteri at operation on patients without ectopic endometrial tissue in the pelvis, but the tubes were not removed. Films on slides were made of the blood obtained from the tubes by stripping them. Epithelium was found in these films and also cells which I was unable to identify. The trauma of stripping the tubes might dislodge tubal tissue and I have, therefore, discarded these. The blood in these cases apparently was coming from the uterine cavity and we know that, at times, it can carry with it bits of the uterine mucosa through the interstitial portion of the tubes, as shown by the bloody contents of tubes after curettage of the uterus.

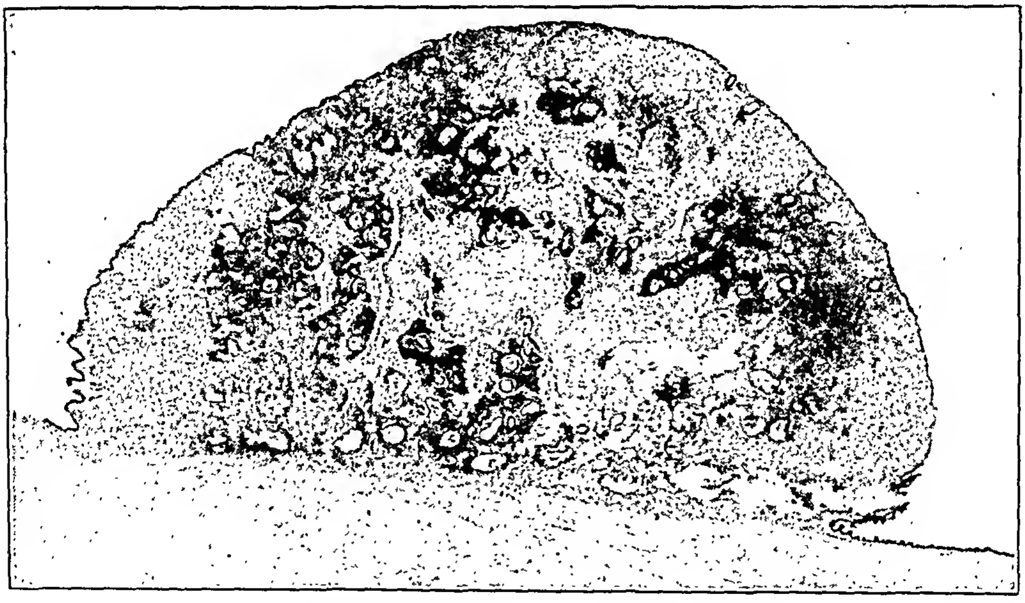


Fig. 58.—Photomicrograph (x 20) of a patch of "menstruating" uterine mucosa in the lining of the tube. Uterus, left tube and ovary were removed for uterine bleeding due to multiple leiomyomas; the patient was flowing at the time of the operation. The right tube and ovary were normal. A hematosalpinx was present on the left side adherent by its closed distal end to the ovary. Implantation-like lesions of endometrial tissue were present on the surface of the ovary adherent to the tube and in the wall of the tube. The blood in the tube evidently came from the endometrial tissue in the lining of the tube. The peritoneal endometriosis may have arisen from the same source, if the endometrial tissue was present in the tube prior to the closure of its fimbriated end. What is the origin of this patch of endometrial tissue? Is it misplaced endometrial tissue of congential origin, or a metaplasia of the tubal mucosa due to the influence of the ovarian hormone? Or even an implantation and subsequent growth of bit of uterine mucosa carried from the uterine cavity into the tube during menstruation or curettage? The patient had been curetted three years before.

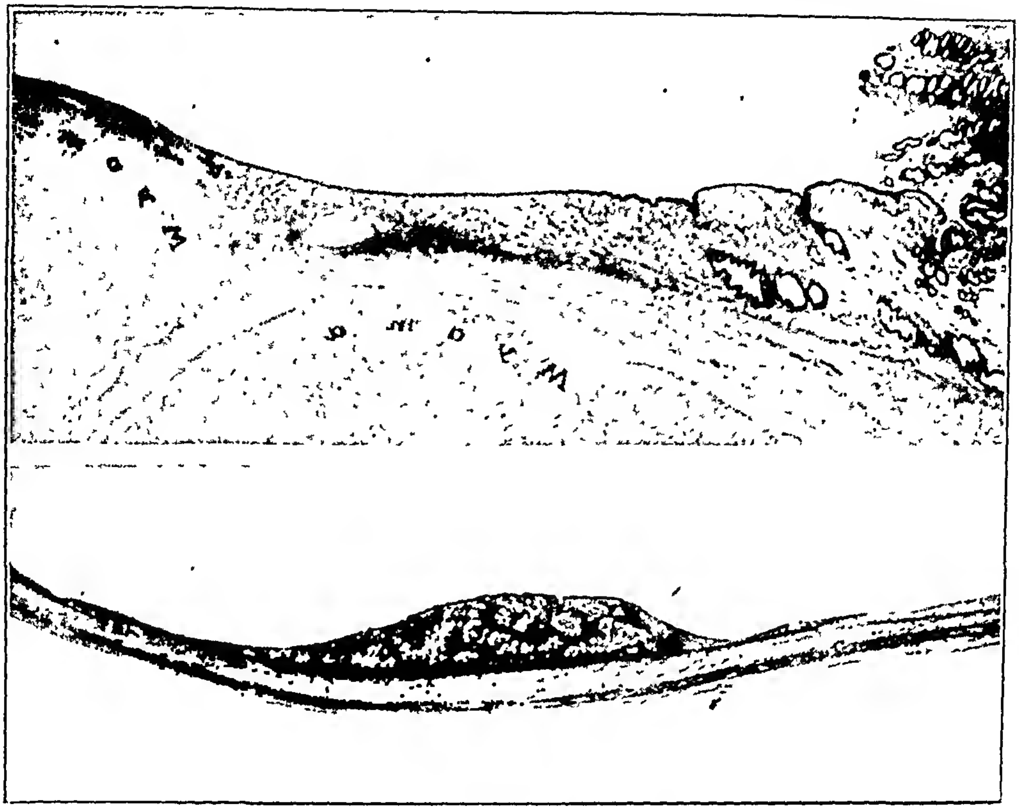


Fig. 59.—Two photomicrographs (x 10): the first of the uterine mucosa over a submucous leiomyoma and the second of the wall of an endometrial cyst of the ovary. The mucosa over the myoma is thin, there is very little stroma, the glands have disappeared and the surface epithelium is low. The patch of endometrial tissue in the lining of the ovarian cyst has the same histologic structure as that of the mucosa of the uterus removed with the cyst. The lining of the cyst on either side of the endometrial tissue has the same structure as that of the uterine mucosa over the myoma (Fig. 60). Is it a follicular cyst of the ovary with patches of endometrial tissue due to a metaplasia of its lining or an endometrial cyst, in which the greater portion of its lining had failed to reach its full growth? I believe the latter.

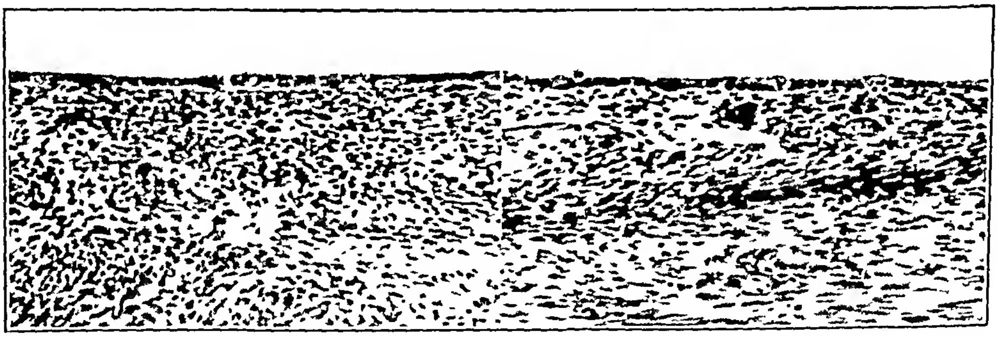


Fig. 60.—Two photomicrographs (x 130), the first of the uterine mucosa over the submucous myoma and the second of the lining of the ovarian cyst adjacent to the patch of typical endometrial tissue. Their histologic structure is the same.

The peritoneal mesothelium, when stimulated by any irritant, may assume an epithelium-like structure. Gland-like inclusions of the mesothelium may arise and also cavities lined by it. Should the irritant contain blood or cause bleeding, the conditions resulting from this might be incorrectly attributed to a menstrual reaction.

Even if peritoneal endometriosis arises from the implantation of endometrial and tubal tissue on the surface of the peritoneum, as I believe it does, this does not prove that all instances of endometrium-like tissue involving the peritoneum arise from this source.

SUMMARY

Menstrual blood escapes into the peritoneal cavity from (1) the rupture or perforation of endometrial cysts or cavities of the ovary and possibly of other pelvic structures; (2) menstruating endometrial tissue growing on the surface of the ovary and other pelvic structures; (3) the uterine cavity as a back flow through the tubes; (4) menstruating tubal mucosa.

Menstrual blood, irrespective of its source, at times, contains bits of endometrial tissue set free by menstruation.

Endometrial tissue disseminated by menstruation is sometimes alive and will continue to grow, if transferred to situations suited to its growth.

The peritoneum and surface of the ovary are suited to the growth of endometrial tissue.

The lesions of peritoneal endometriosis often occur in situations and under conditions indicating (at least suggesting) their origin from menstrual blood escaping from the above mentioned sources.

The local reaction of the peritoneum to the endometrial tissue in peritoneal endometriosis is similar to the local reaction of the peritoneum to cancer in peritoneal carcinosis of implantation origin.

CONCLUSIONS

These studies indicate that peritoneal endometriosis sometimes arises from the implantation of endometrial tissue disseminated by menstrual blood escaping into the peritoneal cavity.

Endometrial and tubal tissue disseminated by other means may do the same. This phase of the subject will be considered in a later paper.

REFERENCES

(1) *Sampson, J. A.:* Arch. Surg., 1921, iii, 245-323. (2) *Sampson, J. A.:* Am. Jour. Path., 1927, iii, 93-109. (3) *Meyer, R.:* Virchow's Arch. f. path. Anat., 1909, clcv, 487 (see 528). *Meyer, R.:* Ztsch. f. Geburtsh. u. Gynäk., 1900, xliii, 130 (see 159). *Kitai, I.:* Arch. f. Gynäk., 1925, cxxiv, 178 (see 202). (4) *Novak, E.:* Am. Jour. Obst. and Gynec., 1926, xii, 501 and 503. (5) *Jacobson, V. C.:* Arch. Surg., 1922, v, 281-300; Am. Jour. Obst. and Gynec., 1923, vi, 257-262; Arch. Path. and Lab. Med., 1926, i, 169-174. (6) *Novak, E.:* Am. Jour. Obst. and Gynec., 1926, xii, 628. (7) *Sampson, J. A.:* Am. Jour. Obst., 1918, lxxxiii, 161-175. (8) *Davis, C. H.:* Am. Jour. Obst. and Gynec., 1926, xii, 526, 527. (9) *Sampson, J. A.:* Surg., Gynec. and Obst., 1924, xxxviii, 287-311 (see Fig. 22).

180 Washington Avenue.

OVARIAN METASTASIS WITH CANCER OF THE UTERINE BODY. IS TRANSTUBAL IMPLANTATION AN IMPORTANT FACTOR?

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THERE is no question that a reciprocal relationship exists between the uterus and the ovary as regards the extension of cancer from one organ to the other. In many cases such considerations as the size and exact location of the tumors, the clinical history, and the histologic examination make the determination of the primary source of the disease comparatively simple. In other cases it may be difficult or perhaps impossible to settle this point satisfactorily. The ovary is an organ which is notoriously prone to the secondary deposit of cancer tissue, not only from other pelvic organs, but even more from such distant locations as the stomach, intestinal canal, gall bladder, breast, or thyroid. It is a striking exception to the old dictum of Virchow, that an organ which is prone to primary cancer is rarely the seat of a metastatic cancer, and vice versa.

When uterine cancer and ovarian cancer coexist, either organ may be the primary seat of the disease, or, in rare cases, it is even possible that the two cancers may arise independently of one another. A considerable group of cases in the literature have been interpreted in this last named way, but, in the very nature of things, they must be comparatively rare. The conclusion as to the independent origin of two such tumors has usually been based chiefly upon the difference in type of the two tumors. When dealing with the ovary, however, this would seem to be a hazardous criterion, for there is no organ in the body in which the local environment appears to exert such a profound modifying influence upon the invading cancer as the ovary. This is well illustrated in the well-known Krukenberg tumor, which is secondary usually to a pyloric or other gastrointestinal cancer, and which, nevertheless, presents a microscopic picture not in the least suggesting the usual pyloric cancer.

As to whether the ovary or the uterus is more frequently the primary source in cases of coexistent disease of these organs, opinion is somewhat divided. Pfannenstiel, Werner and others believe the ovary is more often the primary seat. Werner, for example, in his series of 15 cases, considered the ovary to be the primary seat in 6, and the uterus in 4. Three he believed to arise independently, and the other 2 he classed as doubtful. Others feel that the uterus is more often the primary seat, and this is more in accord with our ideas as to the channels of spread of the disease.

This paper will be limited chiefly to a consideration of the means of extension of uterine cancer to the ovary. The material upon which the study is based is a series of 147 cases of adenocarcinoma of the uterus studied in the laboratory of Gynecological Pathology at the Johns Hopkins Medical School. Of this number 7 were found to show extension to one or both ovaries. This group does not, of course, include cases of combined cancer which were interpreted as primarily ovarian, in which, for example, an advanced carcinoma of the ovary was associated with cancer deposit in some part of the uterine wall.

There are four routes to be considered in discussing the propagation of cancer from the uterus to the ovary, viz.: (1) the lymph stream; (2) the blood stream; (3) direct extension, and (4) implantation of cancer material transported through the tube.

The Lymphatic Route.—The accepted channel of dissemination of cancer in any part of the body is the lymph stream. This, of course, is not a mere assumption, for this method of spread has been incontrovertibly demonstrated by microscopic study. Whether one believes in the importance of the permeation theory of Handley, or whether one accepts the possibility of transportation to a distance of detached cancer cells, as most authorities do, is beside the point. Certainly no one today will deny that cancer of the breast, or of the stomach, or of the lip, or of the cervix is spread by the lymph route above all others. It is, indeed, almost the only one considered by the surgeon in planning his operative attack upon the disease. This same view has been held by most gynecologists and pathologists with regard to the dissemination of cancer of the uterine body.

The lymphatic supply of the corpus uteri has been exhaustively studied by a number of investigators, particularly Poirier, Sappey, Bruhns, and Kroemer. In a general way the lymphatics arising from the uterine body are arranged in four chief groups, as follows: (1) those proceeding from the lower and middle parts of the corpus to the hypogastric glands at the iliac bifurcation, chiefly to the upper group of these glands; (2) those proceeding with the ovarian vessels between the tube and ovary, receiving in their course the ovarian lymphatics, and terminating in the lumbar glands in front of the lower aorta; (3) those extending between the fundus and the walls of the fallopian tube, and (4) those extending from the fundus, along the round ligaments, to the inguinal group of glands.

This distribution of the lymphatics, to my mind, explains adequately almost all the metastases which occur with corporeal cancer, including those which may be observed in the ovaries. For that matter, I believe that it likewise explains the spread of cancer from the ovary to the uterus, although in this case, recourse must be had to the doctrine of retrograde lymphatic dissemination. This doctrine, however, is accepted by all pathologists, and its possibility is easy to understand. The lymph pressure is extremely low, much lower than that even in the small veins. The lymph circulation, therefore, is a very leisurely one. Cancer cells entering a lymph radical are not swept away quickly, as when they enter the blood stream, but they saunter along slowly, and are easily deflected into bypaths by the slightest obstruction ahead.

Cancer cells from the ovary may thus be deflected back towards the uterus. Careful examination in such cases will often show emboli of cancer cells in the lymphatics between the ovary and tube, as I have myself observed. Similar findings are reported by Kroemer and others.

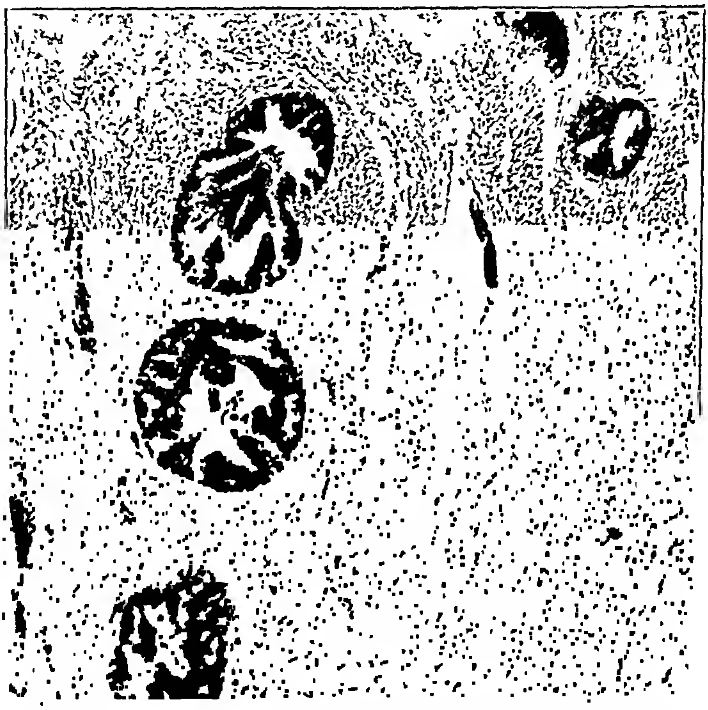

Fig. 1.—Cancer metastasis in myometrium with the primary growth in the ovary. The endometrium in this case showed no trace of cancer, nor did the peritoneal surface of the uterus. The metastasis, I believe, was due to lymphatic dissemination.

Cancer cells thus carried back to the uterus would first find lodgment in the perimetrium and myometrium, so that metastatic nodules would be looked for here rather than in the endometrium. This, as a matter of fact, is exactly what does occur in most cases I have observed. (Fig. 1.) Other authors have made the same observation. Werner, for example, believes that uterine metastases from the ovary occur, in the order of frequency, in the peritoneum first, then the myometrium, and then the endometrium. If this is true of the route from ovary to uterus, how much easier it is to accept the ready possibility of cancer cells from the uterus being carried along with the lymph stream to the ovary, for this involves little or no deviation from the natural course of this lymph drainage.

Another fact which speaks strongly for the lymphatic route is the frequency with which the tube is involved, often without any trace of cancer in the ovary. In some of the reports, indeed, tubal metastasis, not apparently in the nature of simple extension, is found more often in the tube than in the ovary. In 3 of my 7 cases of ovarian metastasis, the tube was likewise involved. This is explained, no doubt, by the fact that there is a very direct route for the cancer cells from the fundus to the tubal wall. It is of interest to note, also, that the tubal metastases most often occur in the tubal wall rather than in its mucosa, as one might expect if the tubal involvement were due to actual implantation of tissue transported out from the uterus. (Fig. 2.) Often, indeed, the mucosa is perfectly normal, although, as the tubal cancer grows, it pushes into the tubal lumen, so that its original site cannot be determined. There is, of course, no reason why a tubal metastasis from the uterus, or a uterine metastasis from the ovary, could not occur in the mucous membrane of either of these

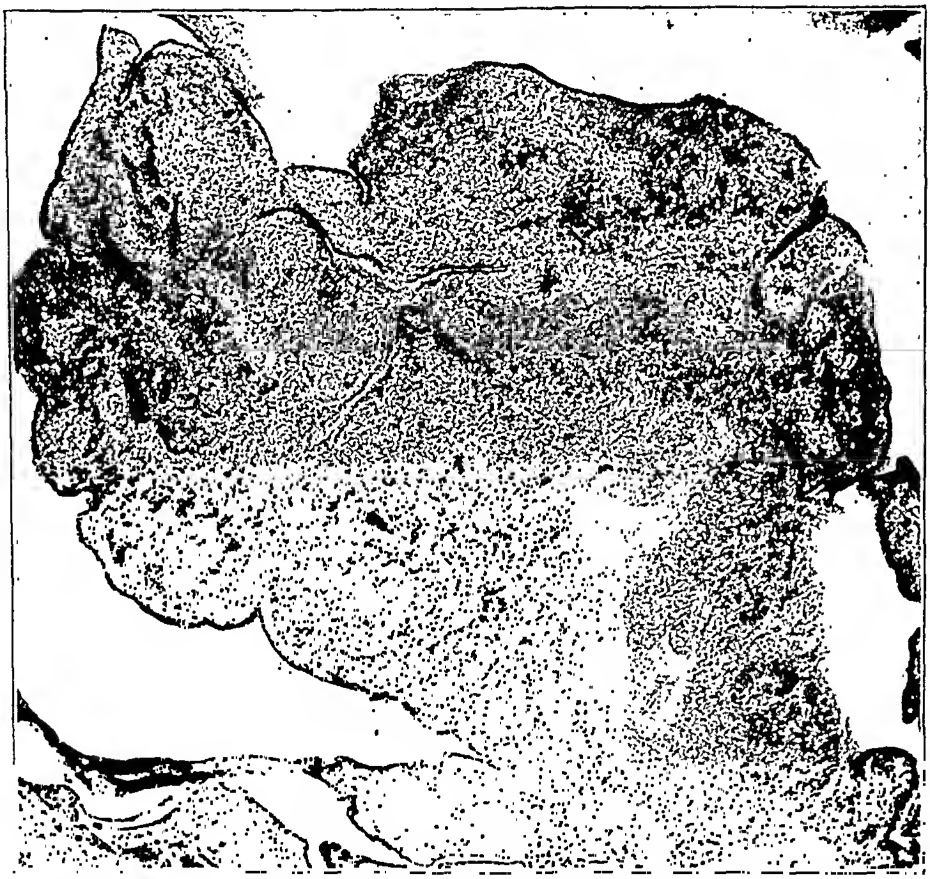

Fig. 2.—Cancer metastasis in tube, in a case of adenocarcinoma of the fundus. There was ovarian metastasis as well. The epithelium of the tube appears intact, and the assumption is that the metastasis was due to lymphatic deposit of cells from the uterus. Note the plugs of cancer cells in the lymphatics in the lower portion of the section.

organs, for both the endosalpinx and the endometrium are richly supplied with lymphatics. The lesser frequency of metastasis in the mucous membrane, as compared with that in the muscle, is apparently due, as already stated, to the fact that the cancer cells usually reach the mucosa only after running the gauntlet of the muscularis.

Of the 7 cases in my series in which adenocarcinoma of the uterus had extended to the ovary, all except one, it seems to me, are logically explained on the basis of lymphatic dissemination. Even this one exception, as I shall discuss later, may be apparent rather than real. In Case 1 there was a typical corporeal cancer, with involvement of one ovary, which, however, was perfectly smooth and only slightly enlarged. Its surface showed no implantation, but cancer was found in the deeper portions of the ovary. Furthermore, plugs of cancer cells could be demonstrated in the lymphatics of the mesosalpinx. (Fig. 3.) The tube showed carcinoma in its wall, although the mucosa was normal. This patient was fifty-five years old.

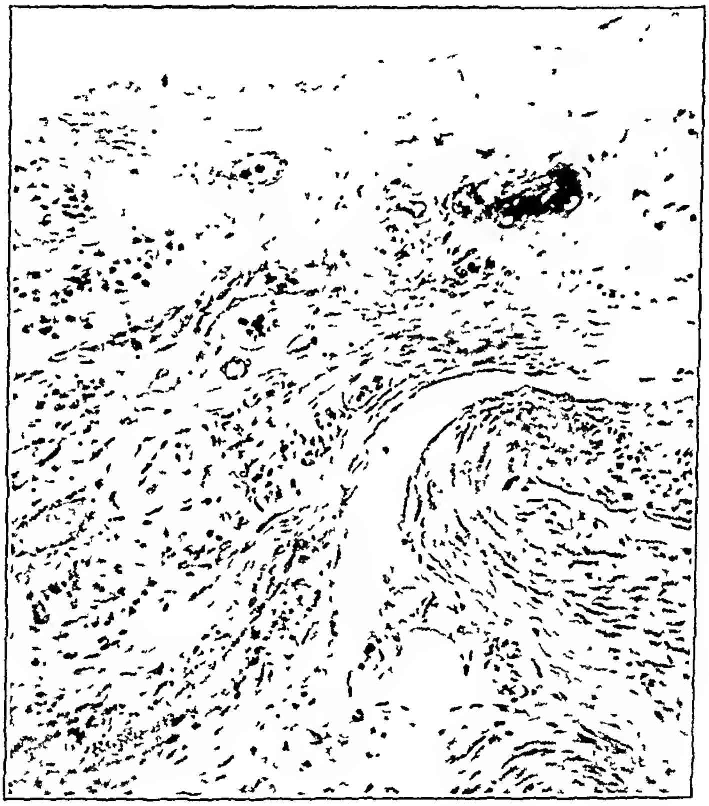

Fig. 3.—Cancer cells in lymphatics of the mesosalpinx, in a case of adenocarcinoma of the uterus with metastasis to the ovary.

Cases 2 (age sixty) and 3 (age forty-six) are almost identical in the distribution of the disease, except that in both of them the ovarian cancers were larger. In both of them, however, the ovarian surface was smooth, and in both of them cancer emboli could be demonstrated in the lymphatics of the broad ligament. In Case 4 (age fifty) the uterine cancer was associated with a small cancer nest in one ovary, which grossly appeared normal. This cancerous area was not on the surface, as one might expect if the involvement were the result of implantation, but near the hilum, as one would expect if the cancer had been imported by way of the lymphatics (Fig. 4).

Case 5 (age fifty) was characterized by involvement of both the left tube and left ovary, the ovarian tumor measuring 6 by 4.5 by 2 cm. Incidentally, both tubes were completely sealed by advanced inflammatory disease, the left tube forming a hydrosalpinx 3 cm. in diameter. This fact would seem to have precluded the possibility of transportation of cancer material though the tube from the uterine cavity. Cancer plugs were found in the lymphatics of the tubal wall, although this would be expected because of the presence of a definite cancer focus in the tube. In Case 6 (age forty-seven), finally, there was an adenocarcinomatous growth of rather small size (3.5 by 2 by 1 cm.) in the uterus, near the right cornu. The left ovary measured 3.5 by 2.5 by 2 cm., and its external surface was smooth and uninvolved. On section, a friable area was seen near the hilum, and this was shown microscopically to be cancer. The right ovary was the seat of a multilocular cystadenoma about 12 by 6 by 6 cm. in size,

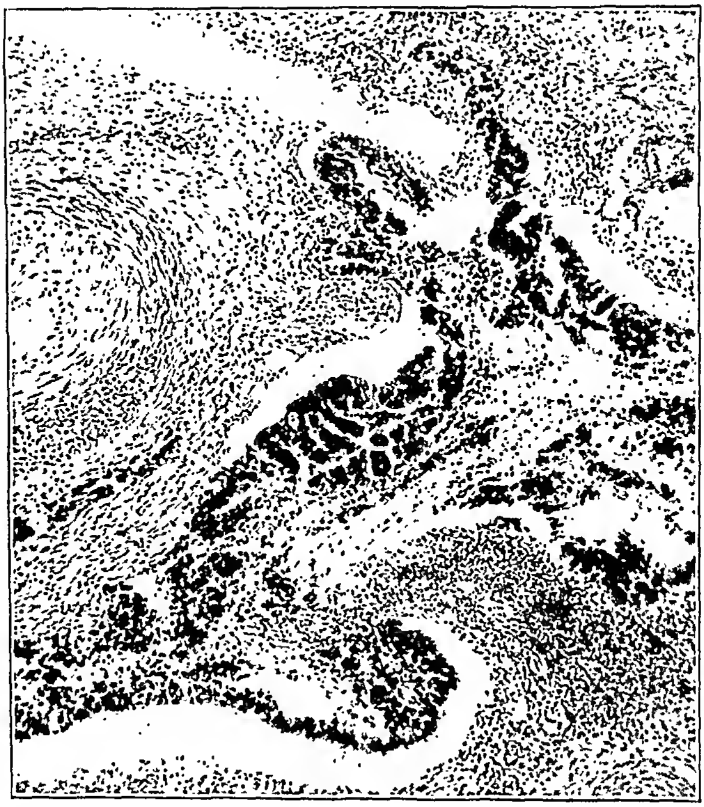

Fig. 4.—Small cancer metastasis, apparently of lymphatic origin, in the hilum of the ovary. The organ was not enlarged, and its surface was perfectly smooth. Only this one small cancer nest could be found in the ovary. There was an adenocarcinoma of the uterine body.

with a twisted pedicle. Near the hilum of this ovary was a friable cancer area 2.5 by 3 cm. in diameter, with a structure similar to that seen in the other ovary. To explain such a case on any other basis than that of lymphatic dissemination would seem far-fetched.

I have laid some stress on the fact that in all these cases the surface of the ovary was smooth and uninvolved, as I do not see how this condition could obtain if cancer had planted itself on the surface.

Blood Vessel Route.—While cancer is believed to be disseminated chiefly by the lymphatics, there is no doubt that the disease may at times be propagated by the venous blood stream. This has been abundantly shown for certain types of cancer, as, for example, the not infrequently distant transportation of hypernephromas arising in the kidney. Arzt has demonstrated a similar route in a case of ovarian cancer which secondarily involved the uterus. As regards ovarian metastases of uterine cancer, Ribbert believes that the blood stream is a more important channel of distribution than is the lymph circulation, although this view is not generally accepted. Certainly there is very little direct evidence bearing on this point. As in other tissues, however, there is no doubt that at times the cancerous process penetrates into venous channels, so that the cancer cells are readily disseminated, perhaps to distant points. For the occasional distant metastases, there would seem to be no other plausible explanation.

Direct Extension.—The progressive growth of a cancer in the uterus is associated with an increasing penetration into the surrounding tissues, this being primarily due to a multiplication of the cells, much as this might occur in tissue cultures. Around the original cancer site there is thus produced a halo of cancer projections which destroy the normal tissue in their growth. Synchronously with this, of course, there proceeds a growth along the lymphatic channels, and a breaking off and deportation of cancer particles for either a short jump or a long journey. In advanced carcinoma of the fundus one will often see cancer masses invading the uterine wall throughout its thickness, so that peritoneal nodules are often produced. In cases in which the ovaries are adherent to the uterus, they may become involved by direct continuity. It is, of course, difficult at times to draw a sharp distinction between direct extension and lymphatic propagation, as already stated. For example, Milner has demonstrated definite lymphatics, containing cancer cells, in the adhesions between a cancerous uterus and the ovary which had become involved, apparently by direct penetration of the cancer through the uterine wall.

In one of my own cases (Case 7, age 52), in which the surface of an adherent ovary is involved in the cancer, my interpretation of the process would be the same. In this case, the uterine cancer was extensive, involving not only the entire thickness of the uterine wall.

but the cervix and the broad ligaments as well. This, to my mind, is a more logical explanation than to attribute the ovarian cancer to the growth of cancer tissue transported from the uterus through the tubal lumen. This case is the only one of my series which shows any surface involvement of the ovary, although, I may add, there was marked invasion of the deeper portions as well.

Implantation.—In going over our cases I have been especially interested in attempting to find out how many could be considered to have arisen, with any great degree of probability, from the implantation and growth in the ovary of cancer tissue carried out from the uterus by way of the tube. The incentive for the study was, of course, the paper of Sampson, in 1924, in which this author expressed the view that such a mechanism was probably not uncommon. He reported 4 cases which he interpreted in this way. Furthermore, on the basis of this work, he made two important practical suggestions. The first of these was the advice to ligate the fimbriated extremities of the tubes before proceeding with the removal of the cancerous tissue. The second was a warning to abstain from preliminary curettage unless absolutely necessary, for fear that portions of the curetted tissue might make their way out through the tubes into the peritoneal cavity.

In a paper presented before this Society at its last meeting, I submitted certain evidence tending to cast doubt upon Sampson's views as to the importance of retrograde transportation of endometrial tissue at the time of menstruation, as a cause of pelvic endometriosis. In that paper I alluded also to the incompleteness of his evidence for a similar mechanism in the production of ovarian metastases from cancer of the uterine body. The present study has served to fortify my views on this point.

In the first place, ovarian metastases are a relatively infrequent accompaniment of uterine cancer. In my own series of 147 cases of carcinoma of the body, many of them far advanced, only 7 cases of ovarian cancer were found. Norris and Vogt, in their 115 cases of corporeal cancer, found ovarian involvement in only 2, while the tube was involved in 1. In the 44 cases of Meigs there were 5 with carcinoma in either the tubes of ovaries. Schottländer and Kermauner found only 3 instances of ovarian metastasis in 140 cases of adenocarcinoma of the uterus.

Sampson explains the infrequency of ovarian metastasis as due chiefly to the fact that the great majority of cases of adenocarcinoma of the uterus occur in women well beyond the menopause, which is undoubtedly true. But a not inconsiderable proportion are still actively menstruating. For example, fully 33 of my 147 cases occurred in women not over fifty years old, and fully 13 in women not over forty-five. Thirty-three of Norris' and Vogt's 115 cases were below fifty. In my 7 cases of ovarian extension of uterine cancer only 2 were in the menstruating age. This would seem to speak against the theory of Sampson that regurgitated menstrual blood may easily carry with it cancer particles that reach the ovarian or peritoneal surface and implant themselves.

Furthermore, even aside from the factor of menstrual bleeding, every advanced case of uterine carcinoma is associated with bleeding into the uterine cavity, which, if Sampson's theory were correct, could be readily regurgitated into the peritoneum.

This would theoretically be facilitated by the fact that colicky contractions of the uterus not infrequently occur when there is an intrauterine growth of considerable size, especially as the passageway toward the vagina is often impeded. And yet, in spite of all these considerations, cancer extension to the ovary is exceptional. Furthermore, if tubal regurgitation were frequent, one would expect to find implantations, not only on the ovarian surface, but also on the peritoneum in the immediate vicinity of the fimbriated end of the tube. Such, however, is not the case, as I shall emphasize later in this paper.

In a more recent paper, Sampson has expressed the view that endometriosis is in some cases due to the dissemination of embolic particles of endometrium which enter the uterine sinuses at the time of menstruation. It is possible that this may at times occur. Indeed, I had suggested such a possibility in a discussion of the paper presented by Sampson before this Society, in 1925. I question, however, whether this factor is of importance in the explanation of the cause of peritoneal or ovarian endometriosis in general. If the uterine sinuses at the time of menstruation gave ready admission to endometrial particles, would they not just as readily give entrance to the particles of cancer when that disease is present in the endometrium? And would not such cancer cells be disseminated far and wide along the blood channels? But hematogenous dissemination is rare with corporeal cancer, which, like most cancers, travels by way of the lymph channels. It would seem that there must be some protective mechanism present in the uterine wall to guard against the invasion of the blood and lymph stream which might be expected to occur because of the casting off of the endometrial surface at each menstruation and the consequent opening up of blood vessels and lymphatics.

In his discussion of the subject in 1924, and his description of the 4 cases upon which his views were apparently based, Sampson did not even mention the possibility of a lymphatic origin for the ovarian cancers, although this is the one which would naturally occur to most of us in explaining the metastases in these cases. Certainly this route cannot be excluded, and, as this is the recognized route for cancer dissemination, it cannot be dismissed without much stronger evidence than is contained in Sampson's paper. I shall not analyze these cases, but I believe that most pathologists, on the premises which his case reports give, would conclude that the cancer had been disseminated through the usual lymphatic channels. In some of my own cases, which have been quite similar to those of Sampson except for the admixture of sarcoma in one or two of the latter's cases, cancer cells can be actually seen in the lymphatics of the tube or broad ligament.

It would seem that Sampson has attached too much importance to the occasional findings of free cancer particles in the lumen of the tube. Such a finding is becoming increasingly frequent as we search for it more intensively, but there is as yet no justification for considering that these broken off particles are responsible for the extension of the growth. Some of these particles—in my opinion, most of them—are moving downward toward the uterus rather than upward toward the peritoneum.

Certainly where there is a vegetative growth present on either the uterine or the ovarian surface it would be strange if particles of the friable tissue did not, through sloughing or possibly through some form of trauma, break off and migrate. This may happen with cancer in any part of the body. It undoubtedly occurs with cancer of the pylorus, the broken off particles passing into the intestine. But metastasis occurs not along the line of tissue migration, but along the lymphatic channels. The same process occurs with fungous cancer of the cervix, in which case the particles are expelled through the vagina. But, here again, the metastases follow the distribution of the lymphatics. These examples might be multiplied.

In the case of corporeal adenocarcinoma, the path of the broken off tissue, in the event of its being forced backward along the tube, happens to parallel the route of the lymphatics, and hence the distinction cannot be made so sharply. But, as I have already said, there is no justification for assuming a special mechanism here until more definite evidence is produced. I shall not again review the question of whether or not retrograde transportation of tissue through the tube actually occurs with any great frequency, as this was discussed in my former paper. I may merely add that such a backward propulsion would seem especially hard to conceive of in the usual body cancer case because we have to deal with a senile, contracted tube which has probably lost any peristaltic activity that it might have possessed in earlier life. Furthermore, the factor of menstrual regurgitation, to which Sampson attaches so much importance, is no longer operative at this age.

The whole subject of implantation cancer is apparently viewed with an increasing skepticism by pathologists. More and more evidence is being brought forward in favor of the view that many instances of what was formerly looked upon as implantation are really due to lymphatic dissemination. For example, carcinoma of one lip of the vulva may at times be associated with a "contact infection" of the other lip. These are now looked upon as being due to lymphatic metastasis. Again, as MacCallum says, the carcinoma nodules which may be observed in the pleura with carcinoma of the lung, and which were formerly explained on the implantation theory, have been definitely shown to be continuous with underlying cancer-containing lymphatics. Sampson believes that cancer particles may implant themselves on the mucous surface of the tube. Such a possibility seems very remote, if one may judge from general pathologic literature.

One of the most interesting gynecologic examples of supposed implantation of cancer is seen in the not infrequent association of pyloric and ovarian cancer. In these cases the popular explanation has been that cancer cells from the pylorus have been sifted down, aided by intestinal peristalsis and perhaps by the movements of the omentum, until they come into contact with the ovary, where they plant themselves and grow. But in many of these cases the pyloric cancer is small, and there is no demonstrable penetration to the serosa.

Again, why do the cancer cells, if they actually do enter the peritoneum, gravitate all the way to the ovary, leaving undisturbed the peritoneum over the intestinal and other viscera, although even an intact peritoneum offers a very suitable nidus? The germinal epithelium is really thicker and probably more resistant than the peritoneum elsewhere, and certainly the tunica albuginea is a dense and not a very vascular tissue. Ovulation, of course, makes a break in the ovarian surface, but this break is quickly repaired, probably within a matter of hours.

Moreover, the ovarian cancer which is rather characteristically seen in association with stomach cancer has a smooth surface, and retains the general shape of the ovary. It shows no surface growth, as would be expected if the cancer were planted from the outside, and, indeed, often shows a definite outer capsule. These and other considerations are difficult to reconcile with the implantation theory.

A more plausible explanation, to my mind, is the one based on the assumption of lymphatic dissemination. The lumbar glands, which receive the upper uterine and ovarian lymphatics, are in close communication with the retrogastric glands, which are involved in most cases of pyloric cancer. Amann reports finding the lumbar glands enlarged, presumably from cancer, in several cases of ovarian cancer associated with pyloric cancer. So far as I have been able to learn, a complete demonstration of this route of dissemination has not been made, probably because of the inherent difficulties of the problem. It would mean a serial section study, an almost impossible task under the circumstances.

It would seem difficult, on the implantation basis, to explain the characteristically bilateral involvement of metastatic ovarian cancer of this type. On the other hand, since the lymphatics of both ovaries terminate in the lumbar group of glands, such a bilateral involvement would seem quite natural.

Much of what has just been said as to ovarian carcinoma which is secondary to pyloric cancer, applies with equal force to those cases which are associated with adenocarcinoma of the corpus uteri. If implantation of transported material were a common cause, one would expect to find ovarian metastases much more frequently, and especially in women during menstrual life. But they are rare at any age, and especially rare during the reproductive epoch, as I have already indicated. Furthermore, they are characteristically bilateral, a fact which suggests a metastatic extension from a central distributing focus, such as the lumbar glands, rather than a simple accidental implantation. Again, if cancer material from the tube were carried out into the peritoneum, one would expect to find, more frequently than is the case, carcinomatous growths on the peritoneum near the fimbriated extremity of the tube, perhaps even in relatively early cases of body cancer. As a matter of fact, peritoneal carcinosis, rather rare at best, almost never occurs until the disease is in an advanced stage, usually not until it has penetrated to, or almost to, the peritoneal coat of the uterus. It is not rare, even in such advanced cases with peritoneal metastases, to find the ovaries normal, although theoretically they would be the first stopping place of cancer material escaping from the tube.

For the reasons which I have indicated I believe that there is little evidence to indicate that implantation of transported cancer material plays a rôle of any great importance in the production of ovarian metastases. Indeed, so far as I have been able to find, it has not as yet been indisputably established in a single case. The mere finding of free cancer particles in the tubes, as I have already indicated, cannot be considered as evidence that a cancer of the ovary has been produced by such migration of tissue. This would be "post hoc, ergo propter hoc" reasoning of the worst sort. Certainly, from what we know of cancer dissemination generally, one is not justified in assuming an implantation origin of ovarian metastasis unless the well-authenticated lymphatic mechanism can be excluded.

I do not, of course, mean to apply that cancer implantation cannot occur under any circumstances. In the peritoneal cavity, at any rate, the general dissemination which is not infrequently found with ovarian carcinoma is commonly explained on the implantation basis, and it is quite possible that this view is correct. In a broad sense, indeed, the peritoneal cavity is a magnified lymph space, and peritoneal implantation of cancer is thus easier to conceive of than implantation upon an intact mucous surface. The other example of implantation which suggests itself to the operating surgeon is the variety which may be observed, though rather rarely, in the scars of operative incisions. One is therefore not justified in denying the possibility of implantation altogether, although, as already stated, the occurrence in general is being viewed with increasing skepticism by pathologists.

From what has been said in this paper, it need scarcely be added that I do not feel convinced of the value of Sampson's recommendation to ligate the tubal ends in all cases in which a cancerous uterus is to be removed, or the wisdom of his advice to abstain from preliminary curettage except in very doubtful cases. As regards the first of these procedures, it is, of course, hard to find fault with any bit of technic which adds in even the slightest degree to the safety of any operation. Whether valuable or not, there is certainly no harm in this procedure, and it is possible that future investigation will show that it has a very definite value. From the evidence thus far available, however, I question whether this operative step will improve our operative results very materially, except of course where there is associated tubal cancer. Here it would seem to be a valuable means of preventing a squeezing out of cancer material from the tube. In the ordinary case, in which the tubes are perfectly normal, or at any rate, free from cancer, the value of tubal ligation will not be great.

It is far more important, to my mind, to guard as far as possible against squeezing cancer cells into the lymphatics by improper manipulation of the uterus. The early application of clamps to the broad ligament will do much to prevent such operative dissemination of cancer cells. Clamps applied vertically, at each side of the fundus, moreover, will furnish a convenient means of traction upon the fundus. If a direct means of elevating the uterus is desirable, the use of a heavy traction suture through the fundus is preferable to the compressing type of uterine traction clamp sometimes employed. The latter would certainly seem capable of squeezing cancer cells into the lymphatics of the uterine wall.

To repeat, therefore, while there can be no objection to tubal ligation, the evidence at hand would seem to indicate that this procedure is not nearly so important as the employment of means to avoid lymphatic dissemination of cancer cells at the time of operation.

Speaking of the dangers of diagnostic curettage as a preliminary to cancer operation, Sampson states that he uses diagnostic curettage only in those in whom he does not suspect cancer or when he considers the patient a poor operative risk. In all other cases of suspected cancer of the body of the uterus he removes the uterus without a preliminary curettage. This, to my mind, is an unwise and dangerous teaching. It impresses one as having even less justification than the advice to refrain from diagnostic curettage because of the danger of lymphatic dissemination. Certainly there is at least some evidence to suggest that possibly curettage in cancer, like incision into a malignant breast tumor, may lessen a patient's chances for cure. And yet, as Frank has well emphasized, nearly all gynecologists practice this method. There are two reasons for this. One is that the evidence as to the dangers of this gynecologic procedure is as yet unconvincing, if one may judge from such reports as that of Norris and Vogt, in which the final results are compared in cases curetted and those not curetted. The second and probably more important reason is that it is only by microscopic examination of the scrapings that we can, in a large proportion of cases, make the diagnosis, and thus avoid grave abdominal operations in many cases in which mere symptomatology might seem to justify them. There are, however, certain cases in which the omission of curettage is justified; for example, persistent and perhaps profuse uterine bleeding in women well beyond the menopause. But in cases of bleeding of slighter amount or shorter duration even in old women, and especially in suspicious cases in women who have not yet passed the menopause, the diagnosis is usually absolutely impossible without the aid of the microscope; i.e., without diagnostic curettage.

In many cases where I had suspected adenocarcinoma I have been agreeably surprised to find no evidence of cancer under the microscope. Furthermore, from the examination of tissue obtained by other surgeons under similar circumstances, I know that this is a common experience. To have removed all these uteri would have meant an unnecessary mortality,—not inconsiderable even with expert operators, and much more serious in the hands of less experienced surgeons who might follow this advice. Even, therefore, if we were certain that diagnostic curettage were associated with a definite risk of dissemination, most of us would choose this in most cases in preference to the greater risk of performing panhysterectomy unnecessarily. Furthermore, it is to be remembered that the cases in which radical operation is justifiable without preliminary curettage, are obvious ones, of long duration. The early cases, however, for which we should be always on the alert because of their ready curability, cannot be diagnosed except by microscopic examination of the curettings.

All that has been said as to the justifiability of diagnostic curettage in spite of a theoretical danger of lymphatic dissemination applies with far greater force to the performance of preliminary curettage, in spite of the theoretic danger of implantation from cancer tissue escaping through the fimbriated extremities of the tubes into the peritoneal cavity. The evidence for the latter danger is as yet very incomplete. In fact, it is perhaps not too much to say that it has not been conclusively demonstrated in a single case. The occasional occurrence of menstrual regurgitation through the tubes—for I believe it is only occasional—and the finding of bits of endometrial or even cancer tissue in the tubes is not conclusive, as I have already emphasized.

The ideal method of management of cases of suspected adenocarcinoma will, I believe, obviate any danger of either lymphatic or tubal dissemination, and, in addition, it possesses other valuable advantages. Diagnostic curettage should be done, but it should be followed at once by the radical operation if cancer be found, and not after an interval of from one to many days. This method depends, of course, upon a proper frozen section technic, which should be a part of the equipment of every operating room. It is only rarely that an accurate diagnosis cannot be made from the frozen section, for with adenocarcinoma, even more than with other types, the diagnosis is commonly made from the microscopic pattern rather than from the study of cell changes.

Once the diagnosis is made, there is no advantage, but much disadvantage, in deferring the operation. Such a course would mean the necessity of a second anesthetic, a harrowing period of suspense to the patient and her family, a greater economic outlay, and a theoretic possibility of dissemination of the growth by one mechanism or another. All these disadvantages are avoided by immediate operation, if other considerations indicate this. This plan of course presupposes that the surgeon is qualified to be his own pathologist, or else that the operating room is closely linked up with the laboratory, so that an immediate diagnosis is available.

SUMMARY AND CONCLUSIONS

The study of the material on which this paper is based, and also a review of the literature, indicate that the lymphatics constitute by far the most frequent route for the extension of corporeal cancer to the ovary. This is what we would expect from our knowledge of cancer characteristics in general. Some of the evidence for the spread of corporeal cancer by the lymphatics may be summarized as follows: (1) The lymphatics have been shown to be chiefly responsible for the spread of carcinoma elsewhere. (2) Our knowledge of the lymphatic drainage of the uterus explains quite satisfactorily the distribution of the metastases, in the ovary as well as elsewhere. (3) Emboli of cancer cells are often found in the lymphatics. (4) Cancer metastasis of the tube is often found either with or without ovarian metastasis. It not infrequently occurs in the wall of the tube, perhaps without mucous membrane involvement, as would be expected if implantation were important. (5) The surface of the ovary is characteristically smooth and uninvolved, as we would expect with lymphatic metastasis, but not with direct implantation of cancer particles on the surface. (6) The bilateral distribution so common with ovarian carcinoma suggests a lymphatic source rather than one by implantation. (7) The lymphatic theory, rather than implantation, explains ovarian metastasis with pyloric cancer, although this problem has not yet been satisfactorily solved. (8) The finding of free cancer particles in the tube in cases of uterine cancer does not justify the conclusion that associated pelvic cancer is caused by implantation of such particles, even in the event of their being regurgitated through the tube. More often these particles are probably moving downward toward the uterus. (9) The cases reported by Sampson of supposed implantation cancer of the ovary are far more logically explained as due to lymphatic dissemination. (10) In view of the demonstrated importance of the lymphatics in the spread of carcinoma, we are not justified in explaining a case as due to direct implantation unless the lymphatic route has been excluded. So far as I know, this has not as yet been done in any case. (11) Of the 7 cases of ovarian metastasis herein reported, 6 appear to be logically explained on the lymphatic theory, while in the remaining one direct extension may have been the chief factor concerned. A study of cases reported in the literature bears out the impression that the lymphatics are the important route for dissemination.

In the operative removal of the cancerous uterus, cognizance should be taken of this prime importance of the lymphatics in the dissemination of cancer cells. The danger of squeezing such cells into the lymphatics is lessened by the early application of clamps to the broad ligaments, and by avoiding the use of strong compressing clamps to the uterus. The ligation of the fimbriated extremities of the tubes, as advocated by Sampson, is an extra precaution which seems worth while, especially where there is suspicion of tubal involvement.

Issue is taken with the advice of Sampson to avoid preliminary curettage except where there is no suspicion of cancer, or where the patient's condition contraindicates radical operation. Such a policy, if generally adopted, would inevitably lead to many unnecessary hysterectomies and a certain number of unnecessary deaths. The evidence as to the danger of diagnostic curettage in such cases is very inconclusive, while the evidence as to its indispensable value must be attested by every practicing gynecologist. The ideal plan, except in very obvious cases, is to curette, to make an immediate diagnosis from the frozen section, and to proceed at once with the radical operation if malignancy is found.

REFERENCES

(1) *Pfannenstiel:* Veit's Handb. f. Gynäk., 1897-1899, iii, (first half), 230. (2) *Werner:* Arch. f. Gynäk., 1914, ci, 725. (3) *Kromer:* Quoted by Burckhard. Ztschr. f. Geburtsh. u. Gynäk., 1924, lxxxvii, 350. (4) *Arzt:* Quoted by Burckhard. (See ref. 3.) (5) *Ribbert:* Das Karzinom des Menschen, Bonn, 1911. (6) *Milner:* Arch. f.

klin. Chir., 1904, lxxiv, 669. (7) *Sampson:* Surg., Gynec. and Obst., 1924, xxxviii, 287. (8) *Novak:* AM. JOUR. OBST. AND GYNEC., 1926, xii, 484. (9) *Norris and Vogt:* AM. JOUR. OBST. AND GYNEC., 1924, vii, 550. (10) *Meigs:* AM. JOUR. OBST. AND GYNEC., 1922, iv, 241. (11) *Schottländer and Kermauner:* Quoted by Frankl, Arch. f. Gynäk., 1920, cxiii, 28. (12) *Novak* (Discussion): AM. JOUR. OBST. AND GYNEC., 1925, x, 734. (13) *MacCallum:* Textbook of Pathology, Philadelphia, 1916, W. B. Saunders Co., p. 1033. (14) *Amann:* München. med. Wchnschr., 1905, lii, 2414.

26 EAST PRESTON STREET.

TOTAL VERSUS SUBTOTAL ABDOMINAL HYSTERECTOMY

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THE free discussions at various medical meetings on the subject of total or subtotal hysterectomy in cases of benign lesions leave no doubt but that the opinions of the medical profession with regard to the respective merits of the two operations are greatly at variance. This is what might be expected since there is a legitimate field for each operation. During the last ten or fifteen years there have been advocates, among leading gynecologists, of the more general adoption of total hysterectomy for fibromyomas when removal of the uterus is indicated. However, these men have had a great deal more experience with this operation than most surgeons, and it is hardly fair to compare their results or their statistics with those of men who have not had the same training or experience.

The length of time involved in the performance of the operation has an important bearing on the results. Any operation that cannot be completed within an hour will be followed by more or less shock, which in itself predisposes to postoperative complications and high mortality. If total hysterectomy is performed only in simple cases and no attempt is made to remove the cervix at the primary operation, if there is inflammatory disease of the adnexa or degeneration in a low-lying fibroma, or if the patient is obese, the risk should be but little more than that of supracervical amputation. On the other hand, if total hysterectomy is performed only in the complicated and difficult cases, especially those in which there are complications as the result of inflammatory disease, the mortality and morbidity will be much higher.

Myomectomy should be performed during the child-bearing period in preference to either of the more radical procedures when it is practicable, but if tumors are multiple the former may be more difficult, and in some cases in which the cervix is in good condition it is advisable to remove the uterus by the supracervical method. If possible some of the endometrium above the level of the internal os should be saved in the hope of retaining menstrual flow. I am convinced that total hysterectomy should be performed by experienced surgeons in most cases in which hysterectomy is advisable and the patient is in good general condition. In the more difficult cases it is advisable to remove the body of the uterus with its associated tumors first; then by grasping the cervix with a tenaculum forceps it can be much more easily removed secondarily. The subtotal operation, however, should be the operation performed by the occasional operator, and the cervix should be removed only if it contains a definite lesion. As the experience of the surgeon increases he will, as a matter of course, remove the cervix at the primary operation in more cases. I am quite sure that if this rule is followed the mortality will increase but slightly, if any, and morbidity will decrease. Kahn's* advice to examine the cervix carefully and curette the uterine cavity before the abdomen is opened in all cases in which hysterectomy is to be performed will help in the decision as to the extent of the operation necessary.

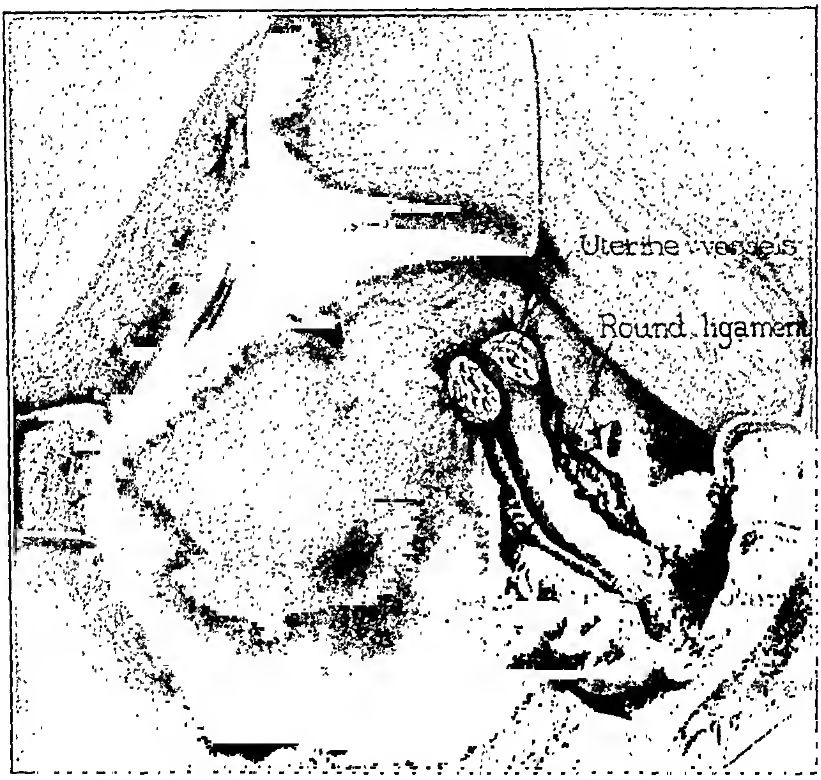

Fig. 1.—Round ligaments. Ovarian and uterine vessels tied.

Many surgeons are inclined to regard removal of the body of the uterus with the fibromyomas attached as the important part of the operation, and thus to overlook other significant gynecologic considerations, such as the state of the lower pelvic diaphragm, and lesions in the cervix uteri. As a substitute for total hysterectomy, coning out the cervical canal has been advised. In this manner most of the cervical mucosa is removed and the tendency to leucorrhea greatly reduced, but if the cervix is lacerated it is practically impossible to remove all the cervical mucosa without removing the entire cervix. The danger of malignancy is ever present in these cases. As a protection against infection, cutting the cervix with cautery and thorough destruction of the cervical mucosa by the free use of the cautery before the abdomen is opened for subtotal hysterectomy, as advised by Cashman, have distinct advantages. There is no doubt that the immediate sterilizing effect of the cautery is excellent and that by it all the mucosa of the cervical canal as well as that covering lacerations can be destroyed. However, the use of the cautery in any of these cases adds to the danger because the devitalized tissue is certain to become infected and increase the danger of peritonitis from being left close to, or in actual contact with, the peritoneum.

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*Kahn's paper was listed but not read at the Meeting of the Western Surgical association, Duluth, Minnesota, October 14-16, 1926.

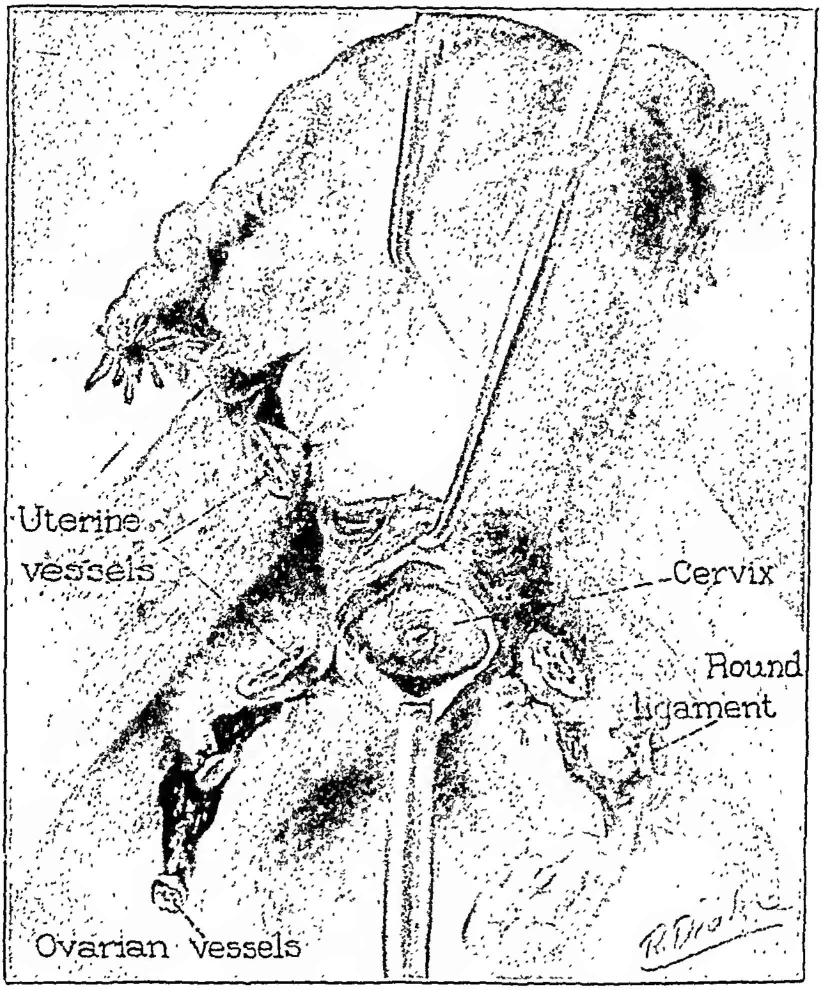

Fig. 2.—Opening vault of vagina posteriorly.

The mortality following either operation should be limited to accidental causes, pulmonary embolism being responsible for about 50 per cent of the deaths. The other most common causes of death are peritonitis, pneumonia, and nephritis. Thorough preparation of the vagina and cervix is a distinct protection against peritonitis. During the last year there have been fewer cases of pulmonary embolism at the Clinic than usual. Such prophylactic measures as frequent change of position, and exercises, as advised by Wilson and Poole, breathing exercises, such as blowing up toy balloons, and the internal administration of thyroid extract, as advised by Walters and Coffey, are of real value. Care in the preparation of the patient and in the selection of the anesthetic will do a great deal toward preventing pulmonary and renal complications. I am convinced that ethylene administered by one experienced in its use adds to the safety of any operation. In cases of postoperative shock following extensive operations I have found the intravenous use of gum acacia solution, as advised by Keith and used by Dr. Ward and his associates extensively, of advantage and preferable to transfusion of whole blood, especially when the blood pressure is dropping.

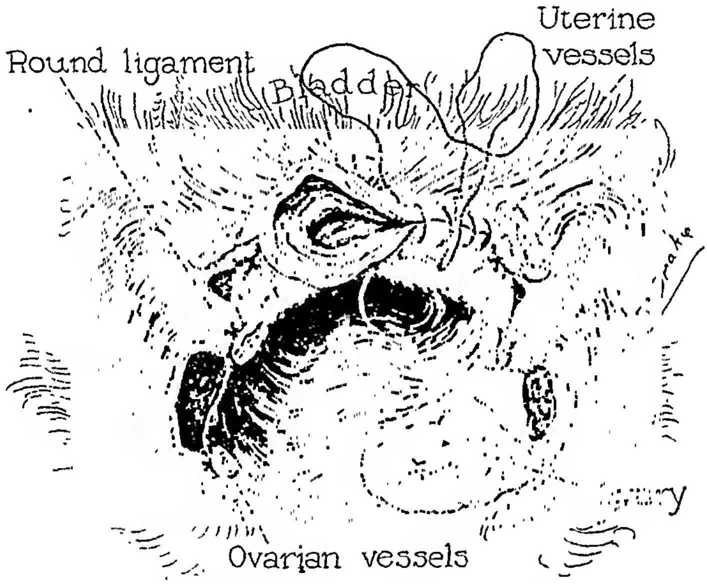

Fig. 3.—Closure of vault of vagina.

During the year 1926, total abdominal hysterectomy was performed in 229 cases in the Mayo Clinic, with three deaths, a mortality of 1.3 per cent. During the same year subtotal hysterectomy was performed 217 times with four deaths, a mortality of 1.8 per cent. Statistics vary a great deal, but in the hands of experienced surgeons the mortality for either operation should not be more than 2 per cent. Considering the fact that many of the patients are very anemic and others cachectic as the result of absorption from degenerating tumors or infection the mortality is surprisingly low and, therefore, hysterectomy may be regarded as one of the safest of abdominal operations.

During the last five years twenty-nine cases of carcinoma of the cervical stump have been observed in the Mayo Clinic. Twenty-one (72 per cent) of these occurred one year or more after the subtotal hysterectomy; 55 per cent occurred at least three years afterward; in one case there was an interval of fifteen years. Besides these there were forty-five cases in which leucorrhea was troublesome; in some cases this began after removal of the supravaginal portion of the uterus. In many other cases there was a complaint of slight leucorrhea or cervicitis, and this was probably responsible for a certain amount of lumbosacral backache and bearing-down sensations, as the result of the spread of infection into the surrounding tissues, especially along the uterosacral ligaments. In such cases there is also the possibility that the cervicitis may be the focus of infection in other parts of the body, as pointed out by Moench, Curtis, Sturmdorf, Langstroth, and others.

Many of the objections to total removal of the uterus, such as the difficulty of the operation, shortening of the vagina, loss of support for the vault of the vagina, and added risk of peritonitis or infection and injury to the ureters, bladder, and sigmoid, are only relative. They depend in large measure on the surgeon's experience with this type of operation.

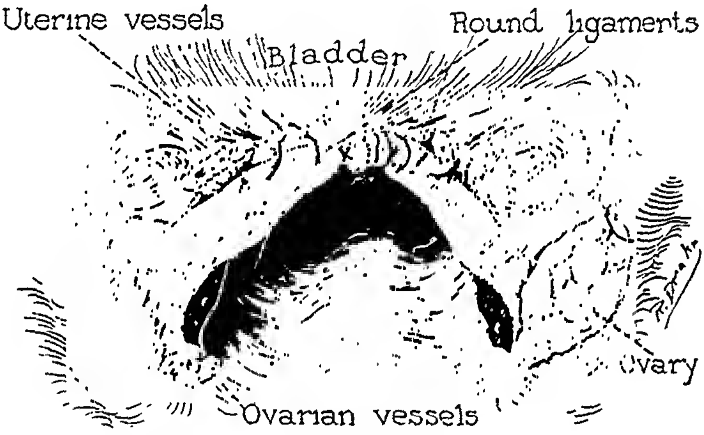

Fig. 4.—Fixation of round ligaments to vault of vagina.

Stitching the round ligaments, the uterosacral ligaments and the stump of the ligated uterine vessels firmly to the vault of the vagina, holds the latter in its normal position; there is no more tendency toward sagging or toward the development of a vaginal hernia than there would be if the cervix were left. Repair of the pelvic floor following either operation is just as important if there have been extensive lacerations of the perineal body. Important structures will not be injured if the normal anatomy is understood and care is taken in the application of forceps and in suturing to control bleeding.

Peritonitis should not occur more frequently from cutting across the vault of the vagina instead of the cervix. In fact, I believe there is little danger if one prepares the vagina with the patient in the lithotomy position after she is anesthetized, using a self-retaining weighted speculum and a tenaculum on the cervix, freely applying 3.5 per cent iodine, and plugging the cervix with a strip of gauze dipped in this solution. In case of purulent endometritis or a degenerating intrauterine submucous fibromyoma, I always close the external os by suturing. Good exposure is obtained by a long low median-line incision, with the patient in the Trendelenburg position, a self-retaining retractor in place, and the intestines and omentum well packed off. I like to protect the intestines with a sheet of rubber dam (45 by 60 cm.) before inserting an abdominal pack.

TECHNIC OF ABDOMINAL HYSTERECTOMY

The round ligaments are first cut close to the horns of the uterus and the distal ends ligated. If the patient is past forty I usually remove both ovaries and tubes by cutting and ligating the infundibular ligaments with the ovarian vessels close to the brim of the pelvis. In younger patients I save the more normal-looking ovary but remove both tubes (Fig. 1). If both ovaries are badly infected I remove both but transplant the more normal-looking parts into the anterior abdominal wall. The peritoneum is then cut completely around the cervix and stripped back, in front with the bladder, and behind with the uterosacral ligaments. The uterine vessels are next secured with three hemostats on each side just before they turn to follow the side of the uterus, then cut, two hemostats being left on the proximal side. If a subtotal operation is to be performed in an elderly patient, the cervix is somewhat coned out. If the patient is a young woman, a small amount of the body of the uterus is left, as well as the cervix. If total hysterectomy is decided on, traction is made on the body of the uterus and the cervix is separated from the bladder, the pelvosacral ligaments, and vault of the vagina by the use of the curved scissors (Fig. 2). I prefer to open the vagina posteriorly first and at once further sterilize it with 3.5 per cent iodine and leave a strip of gauze saturated with this solution in the vault. The incision is then carried around the cervix and the uterus is removed. A running mattress stitch is used to close the vault of the vagina (Fig. 3); the cut edge of the mucous membrane is turned down without stitching into it, and the closure reinforced with a second row of locked sutures. The uterine vessels are then tied en masse by a double suture. The cut ends of the round and uterosacral ligaments and the stumps of the uterine vessels are then firmly stitched to the vault of the vagina with chromic catgut and the raw surface completely covered with peritoneum (Figs. 4 and 5). This step is important. Probably the most serious complication as the result of any pelvic operation is the formation of adhesions from a loop of small

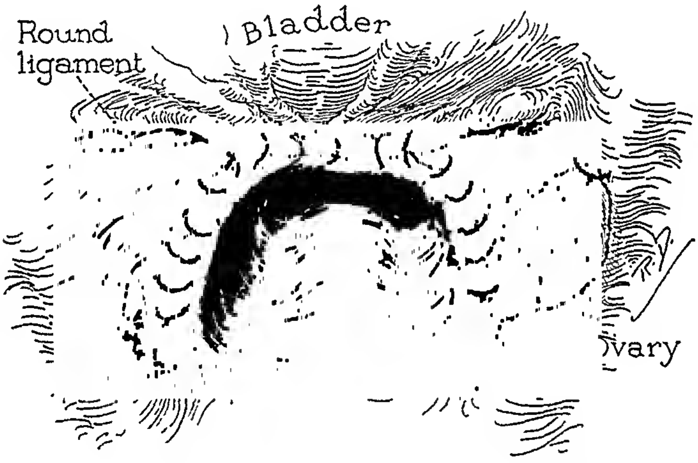

Fig. 5.—Covering of raw surface with peritoneum.

bowel low in the pelvis, thus predisposing to obstruction. There should not be any more raw surface after total hysterectomy than after subtotal hysterectomy, and there should not be any need of peritoneal drainage in any case.

REFERENCES

(1) *Cashman, B. Z.:* Am. Jour. Obst. and Gynec., 1926, xii, 591-594. (2) *Curtis, A. H.:* Surg., Gynec. and Obst., 1923, xxxvii, 657-660. (3) *Keith, N. M.:* Blood Volume Changes in Wound Shock and Primary Hemorrhage, Natl. Health Insurance, Med. Res. Com., Special Report No. 27, London, H. M. Stat. Off., 1919, 16 pp. (4) *Langstroth, F. W., Jr.:* Med. Rec., 1921, xcix, 857-862. (5) *Moench, L. Mary:* Jour. Lab. and Clin. Med., 1924, ix, 289-309. (6) *Polak, J. O.:* Jour. Am. Med. Assn., 1920, lxxv, 579-583. (7) *Sturmdorf, Arnold:* Gynoplastic Technology, Philadelphia, 1919, F. A. Davis Company, 347 pp.

TRANSPLANTATION OF THE URETERS INTO THE BOWEL TO SECURE SPHINCTERIC URINARY CONTROL IN INCURABLE VESICOVAGINAL FISTULA

By Reuben Peterson, M.D., Ann Arbor, Michigan

OCCASIONALLY a vesicovaginal fistula is encountered which cannot be repaired by a plastic operation or a series of such operations. Such cases occur in women who have been terribly mistreated at their confinements. Much of the anterior wall of the bladder has been torn away by instruments or has sloughed away after their use. The bladder with a defective vesicovaginal septum is fixed in the pelvis by adhesions due to infection. Not infrequently it is impossible to locate the cervix amid the adhesions. The fixed uterus can be made out by abdominorectal examination, but the external os is not visible although present, as proved by the passage of menstrual blood.

Every failure to close such vesicovaginal fistulas makes the scar tissue denser and more rigid and increases the chances of failure at the next attempt at closure. The final result in such cases is perhaps to reduce the size of the fistula but to leave the patient dissatisfied and complaining because of the constant dribbling of urine.

Another and even worse variety of vesicovaginal fistula is where the vesical sphincter and adjacent portions of the urethra are absent. Such a condition can result from extensive obstetric trauma, subsequent infection and sloughing or from malignant disease of the urethra necessitating removal of the entire duct. Even where an urethra has been reconstructed, usually after a series of operations, the patient is dissatisfied since sphincteric bladder control can never be supplied once it is completely absent. With such a reconstructed urethra the bladder, after filling to a certain level, overflows, being especially troublesome when the woman is on her feet.

With such conditions present it is but natural for the surgeon to consider whether the urinary stream cannot be diverted into the lower bowel and the passage of urine controlled by the anal sphincter. Obviously this can be done in two ways, one by severing the ureters from the bladder and anastomosing them with the gut, the other by making an additional distulous opening connecting vagina and rectum and closing the introitus.

A review of the literature will show that both these methods were used on human beings as far back as 1851. In that year Simon transplanted both ureters into the rectum in a thirteen-year-old boy suffering from exstrophy of the bladder. The patient lived a year and died of diseased ureters and kidneys.

In the same year (1851) Maisonneuve, in the case of an incurable vesicovaginal fistula, made an opening between vagina and rectum and closed the introitus. The vaginorectal fistula could not be kept open and the patient died of septic phlebitis. The operation had been advocated in 1836 by Jabert and by Berard in 1845 but never executed.

In the seventy-five years which have elapsed since these first attempts, both types of operations have been employed in many cases with varying results. It is not my purpose at this time to review statistically such operations since that has been done at some length elsewhere. As far as possible I shall dwell upon the principles underlying methods of diverting the urinary stream into the lower bowel in order to determine, if that be possible, whether or not the gynecologist is justified in employing either of the two types of operations mentioned above in relieving patients with incurable vesicovaginal fistulas, who otherwise would remain in a deplorable and pitiable condition.

In 1900 I gave to the Society the results of experimental work on dogs in an article entitled *Anastomosis of the Ureters with the Intestine.* At that time I had no opportunity to operate upon human beings, and I doubt very much if I would have done so, feeling as I did about the dangers of ascending renal infection. As far as I could judge then from my experimental work and from a study of the literature, when severed ureters were implanted in the bowel, ascending renal infection always resulted, and inasmuch as it was impossible to determine in advance the extent of such infection I did not consider the operation justifiable. However, while the chance of ascending renal infection cannot be denied after transplantation into the bowel of the ureters with intact ureteral orifices, the infection is, as a rule, of such a type that the chances of the individual's overcoming it are good, hence such operations are justifiable.

These opinions governed my actions when in 1904 I made a vesicovaginorectal anastomosis with colpocleisis in a woman of sixty from whom previously I had removed the entire urethra for carcinoma. This patient led a very comfortable existence for seven years, finally dying of a recurrence of the malignant disease in the cecum.

In 1916, a similar operation was performed upon a patient of thirty-eight, who had been left with an incurable vesicovaginal fistula following a frightfully mutilating obstetric operation. This patient made a good recovery, had perfect control over the urine with no apparent infection of the kidneys, at least, repeated examinations of the filtered urine removed from the rectum showed neither albumen, casts, nor pus. The last of such examinations was made within the past six months. This patient is well satisfied with her present condition of health eleven years after the operation.

There was only one primary death in forty-one cases of this operation collected by me and reported in an article published in *Surgery, Gynecology and Obstetrics* in 1917, and the functional results were excellent. The operation, however, is inapplicable to young women in the childbearing age, and in a number of instances it has been refused by women who have applied to the clinic for relief since it precluded copulation.

While I still believe that the experimental and clinical evidence is in favor of ascending renal infection where the cut ureter is implanted in the bowel, I think now that my former conclusions were incorrect to some extent. A great deal of the clinical evidence was based upon cases where the ureters and possibly the kidneys were infected prior to the transplantation. Infection of the ureters and kidneys was quite sure to follow the transplantation of such ureters. Experimentally, stricture of the ureter at its entrance to the gut was invariably followed by hydroureter and severe pyelonephritis. In extrophy of the bladder the ureters and renal pelves are damaged in a large proportion of cases. This may occur quite early in life. A majority of patients with exstrophy of the bladder die before the age of twenty from kidney infection.

In vesicovaginal fistula ureteral and renal infection is quite rare. In other words, patients with this defect are usually young and without infection of the urinary apparatus. Transplantation of ureters under such circumstances, provided such transplants be performed under certain well-known surgical principles applicable to ureteral work, will be followed by a minimum amount of kidney infection. The kidney infection may be so slight as to enable the organism to overcome it, provided the conditions of the transplant do not change. If the ureteral opening into the gut remains patent and not constricted with resulting hydroureter, ascending pyelonephritis will not occur to any great degree.

This is the probable explanation of the good results following transplantation of the vesical trigonum with its ureteral orifices into the bowel (Maydls' operation), or the even more successful operation of Bergenhem who implanted extraperitoneally, the ureters with a rosette of bladder by separate openings into the rectum. These operations succeeded because the chances of ureteral constriction and resulting hydronephrosis were practically nil. The openings of implanted ureters were bathed in the septic fecal bowel contents but ascending pyelonephritis was reduced to a minimum since ureteral stricture was absent.

The same explanation accounts for the absence of pyelonephritis in the cloaca type of operation. While but little fecal matter passes through the rectovaginal fistula undoubtedly there is some contamination, yet pyelonephritis is practically absent after this operation. This is shown by my own case just quoted where the patient is living and well with no kidney infection after eleven years, and Keen's celebrated case where the patient remained in perfect health with no sign of renal infection twenty-two years after a similar operation. Sweet and Stewart experimentally showed that infection could not be traced along the mucosa of the ureter but was found in the lymph channels and that if the renal pelves were connected directly with the intestines no infection of the kidney occurred.

Hence, the problem of preventing renal infection in the transplantation of the severed ureters into the bowel resolves itself into the question of developing a technic which will produce the minimum constriction of the ureteral bowel orifice so that hydroureter will not result. The many attempts to form valves at the end of the implanted ureters have been futile except as they led to the implantation of unconstricted ureters. The indirect method of implanting the ureters in the bowel, that is, making a longitudinal incision in the intestinal wall through the serosa and muscular coats down to the mucosa and burying the ureter under these coats after drawing its end into the gut through a stab wound in the mucosa was fully described, and employed in 1899 by a Fellow of this Society, Dr. Franklin H. Martin. I employed this method extensively in the experimental work referred to above. Martin's idea was that the contraction of the muscular intestinal fibers would milk the ureters downward and prevent ascending infection. The method was a good one, not because the urine was milked downward but because it made possible the implantation with the least possible trauma to the ureter and less ureteral narrowing. In my own experiments I found "that the dog's ureter was extremely delicate and would not stand sutures passed through any of its coats without danger of resulting stricture. This was obviated by passing the sutures through its fatty and peritoneal envelope."

Coffey's operation of ureteral implantation is based upon the principles laid down by Martin, the burying of the ureters under the serous and muscular coats of the intestine after securing the ureter by a ligature passed through its split end and drawn through a stab wound in the lower part of the mucosa. He obtains good results from his operations not because the implantation reverses what he calls static intraintestinal pressure, but because it is a technic which gives rise to little trauma and constriction of the ureter.

Credit, however, is due Coffey for popularizing the indirect method of transplanting the severed ureters into the bowel. Charles Mayo and others have employed the method extensively since the publication of Coffey's paper and the results of the transplantations under modern technic have been much more favorable so far as ascending infection is concerned.

Under such circumstances I felt justified in transplanting the severed ureters in the following two cases of incurable vesicovaginal fistula.

CASE 1.—Mrs. A. P. Admitted to the Obstetrical and Gynecological Clinic of the University of Michigan Hospital January 6, 1923. She had been unable to control her urine since a very severe operative delivery November 15, 1922 following which she was in bed four and a half weeks. Examination showed a very large vesicovaginal fistula with rigid walls. An unsuccessful attempt was made to close this fistula on January 18, 1923. She left the hospital unimproved and was operated upon a second time by a surgeon in Detroit, in 1925; this time by *the abdominal* route with no improvement.

The patient reentered the clinic January 27, 1926. Examination at this time showed a markedly contracted vagina beginning one and one half inches above the introitus through which the forefinger could not be passed. The cervix was buried in a mass of cicatricial tissue and could neither be palpated nor exposed by the speculum. It was judged to be impossible to close the fistula by a plastic operation and ureteral transplantation was proposed and accepted by the patient who said she was willing to take any risk if she stood a fair chance of being made comfortable.

On February 18, 1926 with the assistance of Dr. Carl W. Eberbach to whom I am greatly indebted for aid in this and the other case to be reported, an extraperitoneal anastomosis of the right ureter with the sigmoid was performed with the following technic as briefly described as possible:

An incision was made from just above the symphysis upward nearly to the umbilicus and one inch and a half from the anterior superior iliac spine. The oblique muscles were severed by a long gridiron incision and the peritoneum exposed and pushed inward. The ureter was readily located, separated from the peritoneum. the latter incised longitudinally low down for two inches, the sigmoid located with intestinal forceps, brought into view through the peritoneal slit and secured in place by a few interrupted catgut sutures. The ureter was loosened down to the bladder, where it was clamped, the lower end being tied with catgut. An incision one and one half inches in length was made in the longitudinal band of the sigmoid through the serosa and muscles down to the mucosa. By careful dissection the incised intestinal wall was loosened from the mucosa one half inch on either side. The end of the ureter was split for one quarter of an inch and the ureteral wall opposite the slit was perforated by a *chromic catgut suture*. A curved needle on each end of the suture was passed through a small incision in the lower part of the mucosa and through the gut wall one inch from the stab wound. The ureter was then drawn into the gut slightly more than an inch and held firmly in place when the two ends of the suture were tied. The muscle and serosal coats were brought over the ureter and held in place by two layers of interrupted chromic Lembert catgut sutures. No sutures penetrated the wall of the ureter. A soft rubber drain was placed at the bottom of the wound which was closed in layers.

The patient made a good recovery; the wound healed well. She began passing urine per rectum in about thirty-six hours and was able to control it perfectly. Repeated examinations of the urine, drawn from the rectum and filtered, showed no albumin, casts, or signs of kidney infection.

The left ureter was transplanted into the sigmoid by a similar technic April 13, 1926, the patient in the interval having returned to her home. The wound healed well and convalescence was uninterrupted. She is able to retain her urine for four or five hours and does not have to get up at night.

She returned to the hospital for examination March 30, 1927, thirteen months after the last ureter was transplanted. She is pleased at the result of the operation since she is able to retain her urine longer than patients with normal bladders, at times as long as eight hours, and she does not get up at night. Her bowels move once a day. There are no signs of kidney infection. Pelvic examination reveals a vesicovaginal fistula an inch and a half above the introitus which admits the forefinger with difficulty. The cervix is buried in adhesions and cannot be felt or seen although the patient menstruates normally. She asks that something be done to the strictured vagina so that coitus may be rendered possible.

CASE 2.—E. B., aged twenty-three. Her trouble dates back to her confinement May 4, 1924 when, after having been in labor two hours she was taken to the operating room and the child turned and extracted. Since the childbirth she has been unable to control her urine. Her local physician operated upon her unsuccessfully, and she was sent to the University Hospital.

Examination showed almost complete absence of the anterior bladder wall and the entire urethra except for its posterior wall.

After some twelve plastic operations, including Ward's operation for the formation of an urethra, the vesicovaginal fistula was closed, but the new urethra was not a success. The newly formed meatus was constricted and there were two small openings at its base. She was much improved but rather unhappy since she had no control over the urine when on her feet and she had to earn her own living. She compared her condition with that of the patient whose case has just been reported who was in the hospital at the same time and begged that the same operation be performed upon her.

The right ureter was transplanted into the sigmoid November 15, 1926 with the same technic used with the first patient. The patient passed urine per rectum in about twelve hours and after a few days four ounces every four hours.

The left ureter was transplanted on December 26, 1926 by the same technic. Through some oversight the lower bowel and sigmoid had not been thoroughly emptied resulting in distension of the sigmoid and contamination of the wound when the stab wound was made through the mucosa. This resulted in seepage of urine and a fecal discharge from the wound for sometime. Eventually these disappeared and the patient was discharged from the hospital February 24, 1927 with perfect control over her urine. The latter showed no evidence of kidney infection.

In a letter received from the patient April 11, 1927 she says she passes her urine by the rectum about every four hours and at times gets up once at night. She is able to work and seems quite cheerful over her present condition when compared with her former miserable state.

COMMENT

I am convinced that the extraperitoneal is to be preferred to the intraabdominal route. No matter how careful the technic of the operation, something is liable to go wrong because it is not like ordinary intestinal surgery where accurate, tight approximation can and should be made. If the stab wound is too closely approximated to the ureter, hydroureter and hydronephrosis with ascending infection will result. This is illustrated by a recent case (to be reported in detail later) where just this condition resulted, necessitating removal of the right kidney.

If there be escape of urine or feces around the opening through the mucosa, the patient will succumb unless the operation has been performed extraperitoneally. Technically it is not more difficult since the ureters are readily exposed and easily transplanted.

I would not desire to expose the patient to the additional risk of transplanting both ureters at the same operation. When this is done you are burning your bridges behind you and something may go wrong.

What will happen to women who have had the ureters transplanted in case of pregnancy? Although not reported I am given to understand that one of Charles Mayo's cases went to full term after this operation and was delivered safely of twins. Evidently the dangers of pregnancy will depend upon how much if any renal infection may be present as a result of this operation. Obviously it would be unfair to these women to sterilize them for possible dangers which may never exist.

REFERENCES

Bergenhem: Eira, 1895, No. 10; Abs. Centralbl. f. Chir., 1896, xxiii, 389. *Buchanan, J. J.:* Surg., Gynec. and Obst., 1909, viii, 146 155. *Coffey, Robert C.:* Surg., Gynec. and Obst., 1921, xxxii, 383-392. *Keen, W. W.:* The Surgical Complications and Sequels of Typhoid Fever, Philadelphia, 1898, p. 80. *Maydl, K.:* For different publications see Peterson below. *Mayo, Chas. H.:* Exstrophy of the Bladder. Contributions to Medical and Biological Research, New York, 1919, Paul B. Hoeber, pp. 895 1110. *Martin, Franklin H.:* Jour. Am. Med. Assn., 1899, xxxii, 159-161. *Maisonneuve:* (Reported by Malgaigne and Le Fort.) Manuel de Médicine Operatoire, 1889, ed. 9, p. 747. *Peterson, R.:* Jour. Am. Med. Assn., 1901, xxxvi, 444; 506; 569; 632; 735; 808; Trans. Am. Gynec. Soc., 1900; idem., Jour. Mich. State Med. Soc., 1916, xv, 538-541; idem., Surg., Gynec. and Obst., 1917, pp. 391-402. *Simon, J.:* Lancet, 1852; 568-570. *Sweet and Stewart:* Surg., Gynec. and Obst., 1914, iv, 210.

TWO NEW IDEAS ON THE MECHANISM OF CERVICAL LACERATION DURING LABOR. A PRELIMINARY REPORT

By J. B. DeLee, M.D., Chicago, Ill.

OUR ignorance of the mechanism of cervical tears and of their frequency and extent is due largely to the teaching and practice of olden time. We were warned not to invade the parturient canal postpartum, unless there was hemorrhage. For years I have inspected the cervix after delivery and have been astonished at the amount of damage even natural labor causes and also amazed at the complicity of the injuries.

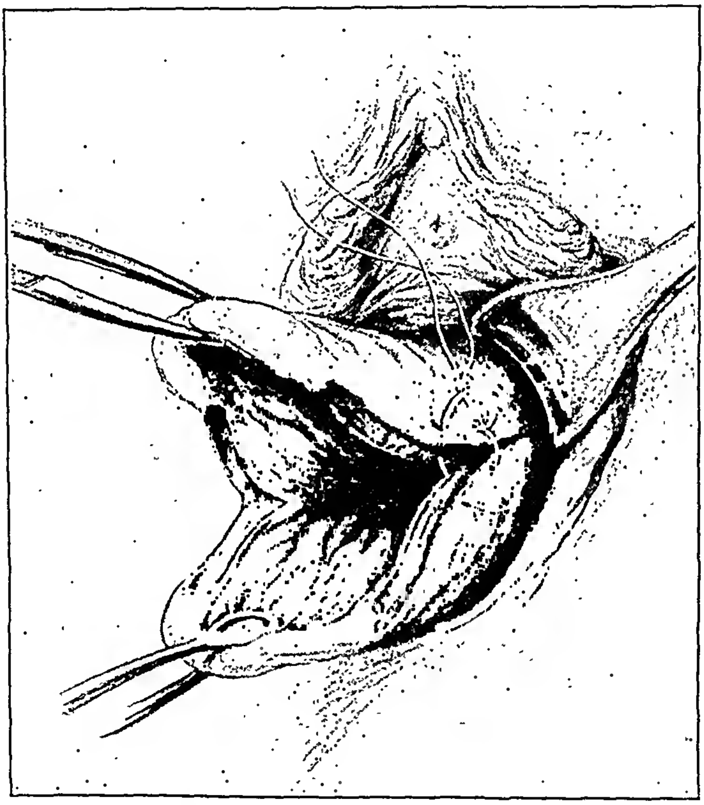

Fig. 1.—The usual laceration or lateral split of cervix.

It is generally taught that the mechanism of cervical laceration is very simple, that when the head distends the cervix it stretches as far as it can and then gives way at the sides, that is, in its congenitally weakest portions. The lacerations then would produce an anterior and posterior lip with a slit on each side like two longitudinal slashes in the cuff of a coat.

In a large proportion of the cases this is the mechanism, but in not a few instances two other mechanisms occur, and it is to these that I particularly wish to draw attention.

Fig. 1 shows the lateral splitting of the circularly overdistended cervix. The strong anterior and posterior lips have not been torn, but at each side, where the musculature and fibrous tissue are weaker, a split has occurred. The deeper tissues have retracted away from the torn surfaces leaving the external mucosa and internal mucosa approximated. In order to repair such a cervix properly it will be necessary to separate these two edges and dig down deep into the cervical body to fish out the retracted muscularis as shown in Fig. 2.

This form of laceration is the easiest to recognize and the easiest to sew up and is the one generally mentioned in the textbooks.

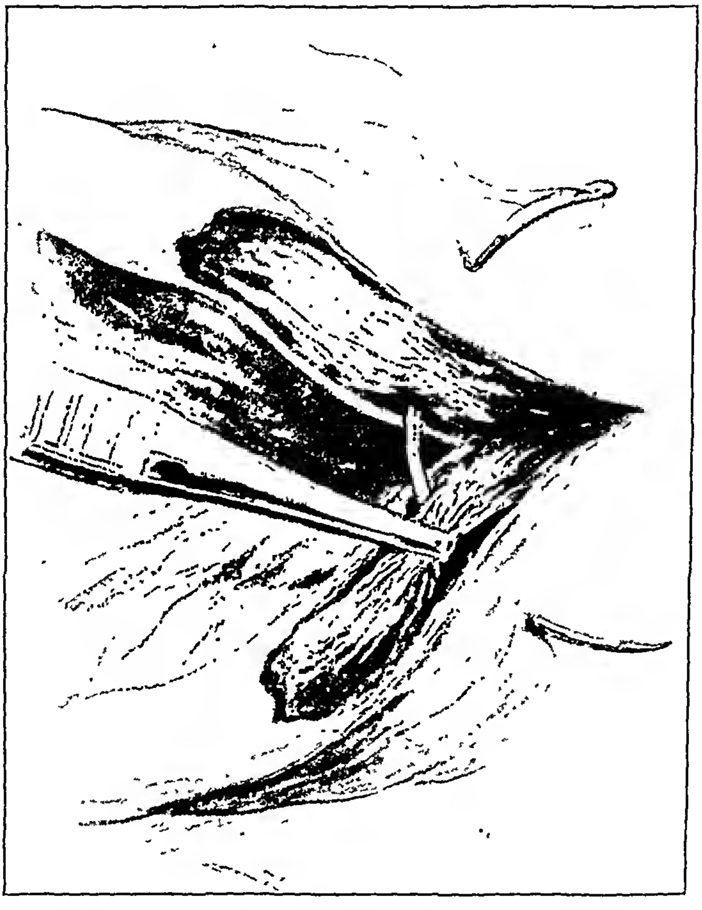

Fig. 2.—Detail of suture. Note how deeper tissues are lifted out to pass needle underneath.

In the second form of laceration, the mechanism of the tear is almost the same, but in this case while the musculature and fibrous tissues give way at the sides of the cervix, which are its congenitally weakest spots, the external and internal mucosae of the cervix do not give way and there is a submucosal parting of the tissues (Fig. 3). Inspection of such a cervix will show *thick anterior and posterior lips with a very much* stretched and excessively thin bridge of tissue on each side. By grasping the internal and external cervical mucosae with two tissue forceps it is usually possible to separate these two layers from one to one and a half inches without any difficulty and discover in doing so that the very edges, apparently intact, in reality have been disunited. Occasionally, however, the edges are not torn at all, that is, the laceration is perfectly submucous (Fig. 3).

In most of such instances the observer would say there was no tear of the cervix since no damage is visible, but later on the cervix will gape and the lining mucosa roll out as in all deep tears.

The repair of such an injury is best made by splitting the mucosa and making a wound like that shown in Fig. 1, restoring the cervix as in Fig. 2, digging out the deeper muscle and fibrous tissue, and lifting it up so as to pass the needle beneath it.

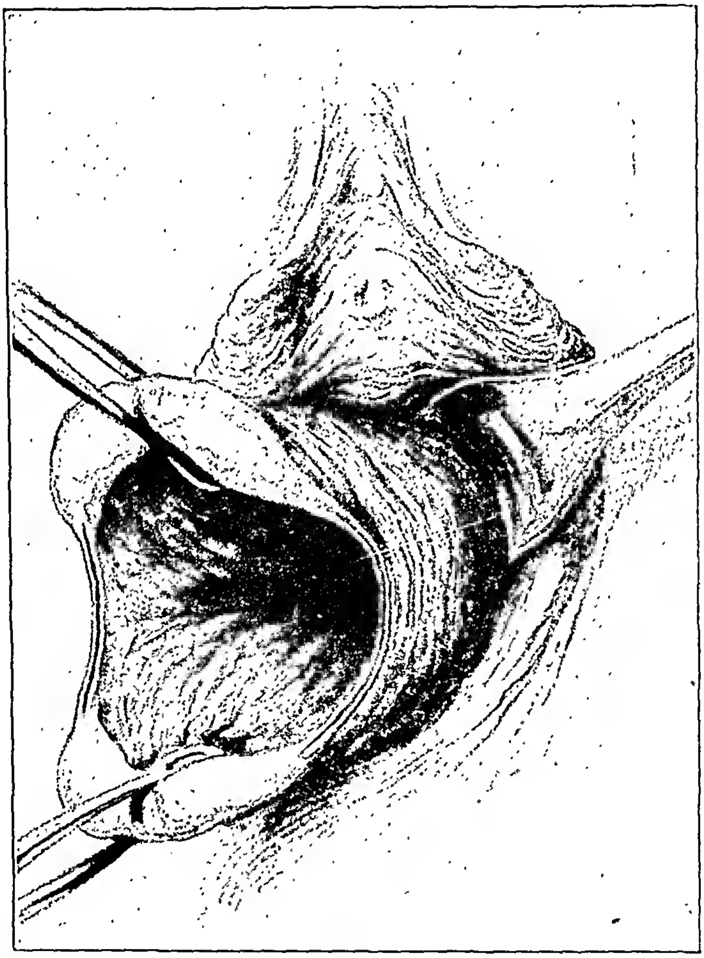

Fig. 3.—Submucous laceration of cervical tissues. Lateral fibers torn and stretched.

The third form of laceration of the cervix is much more complicated and not so easy to repair (Fig. 4).

The mechanism of the tear is complicated and hard to understand, but I believe it is as follows. The cervix is dilated radially to the utmost and the damage to the tissues is general, that is, all the fibers are stretched beyond their limit of endurance. The internal mucosa of the cervix become edematous and is ripped off its base, prolapsing through the external os. The appearance of such a cervix after delivery is not unlike that of the everted anus of a horse (Fig. 5).

The repair of such a cervix is not easy and I have not tried it often enough to make a final recommendation. In a few cases I have attempted it as is shown in Fig. 6 and the results have been good. The edge of the cervix is pulled down with ring forceps while the mucosa is pushed up into the uterus with the four fingers of the left hand, the thumb making counterpressure on the outside. The vagina and bladder are held up by means of a suitable retractor and are not endangered. While the cervix is thus restored to its normal condition at the stage of full dilatation three sutures are placed at about the junction of the vagina with the cervix, *operating from the vaginal side*. These sutures go down into, but not through, the internal mucosa and they hold this prolapsed layer in place until healing is well under way. The procedure is repeated on the posterior lip if necessary but this is seldom. It is similar to the technic of the operation for prolapsus urethrae.

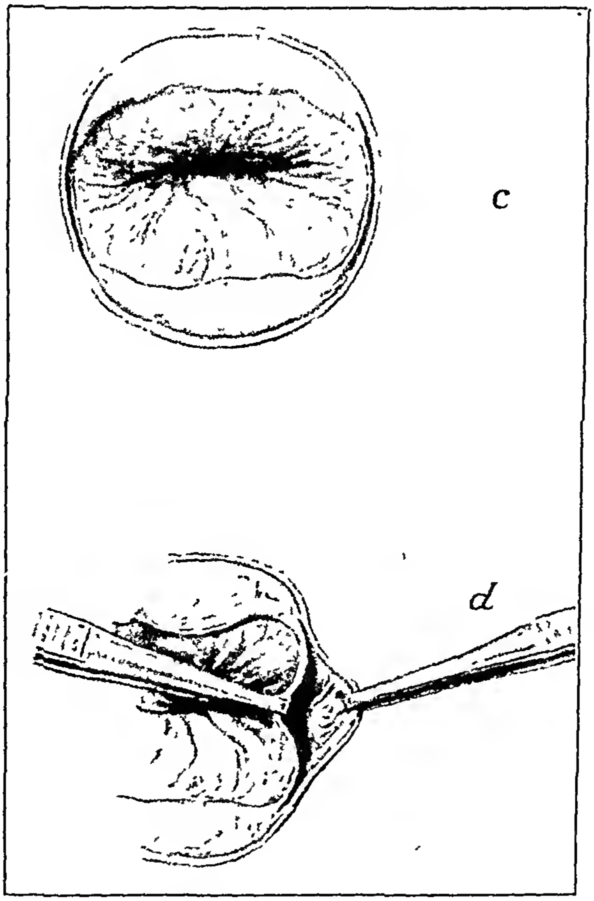

Fig. 4.—*c*, Same as Fig. 3. Shows edges of mucosa split. *d*, Edges of split mucosae separated to show separation of deeper structure.

It is not rare to find combinations of these three mechanisms of cervical tear. The second and third forms of laceration are found together more frequently than with the first. The mechanism of labor has a great deal to do with the formation of these tears but still more depends upon the congenital structure of the cervix and the presence of any kind of disease.

Cervices at birth vary very much in shape and quality. At puberty changes occur in this organ which changes, likewise, are variable and I have often thought that the cervix, as well as the uterus, is under some endocrinal influence. Acquired diseases produce still further variations in the cervix and all these have a great deal to do with the mechanism of dilatation during labor and with the mechanism of the formation of lacerations.

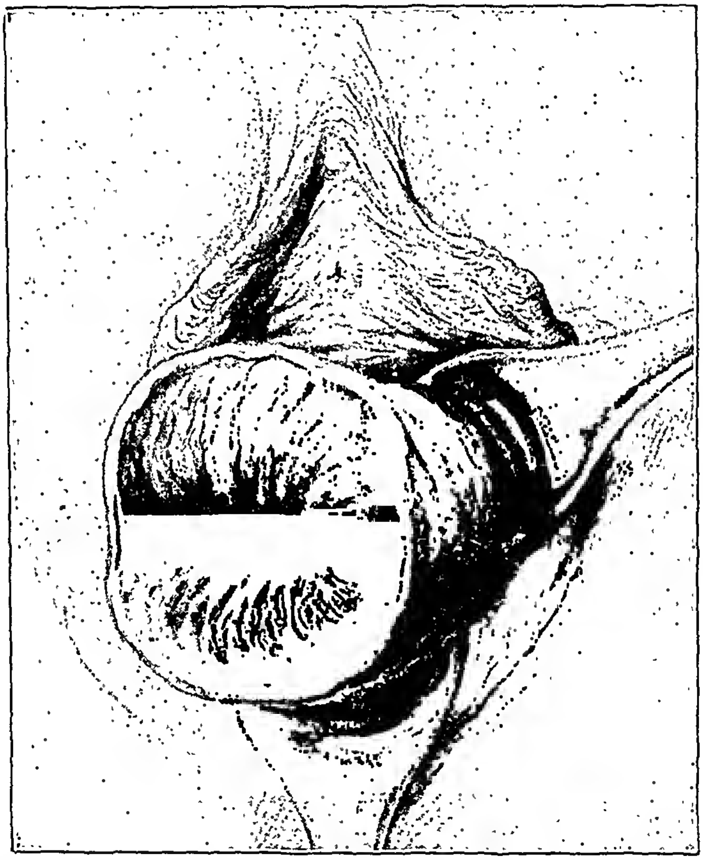

Fig. 5.—Thinning and overstretching of whole cervix with prolapsus of the endocervical mucosa.

I am at present making and collecting models of cervices during various periods of pregnancy, labor, and at the final examination before discharge after labor and I hope at no distant date to be able to report further on this subject.

With greater knowledge of the pathologic and surgical anatomy of cervical tears, our difficulties in their repair have increased. It has become a complicated technical operation to attempt to restore the cervix to its original condition. Under ether it is not as bloody a procedure as under ethylene, but in either case it takes much time, and exposes the patient to some slightly increased risk of infection. For these reasons, the question may well be raised: is an extensive primary repair to be recommended to any but obstetric specialists? Or would it not be better to delay the repair until later in the puerperium as Dr. Hirst did, or Dr. Coffey, who takes all his puerperae to the operating room on the ninth day and does a typical Emmet trachelorrhaphy? Or should we let the woman go with only a partially restored cervix until the examination at the eighth week discloses its state, when we could cauterize it or sew it if necessary?

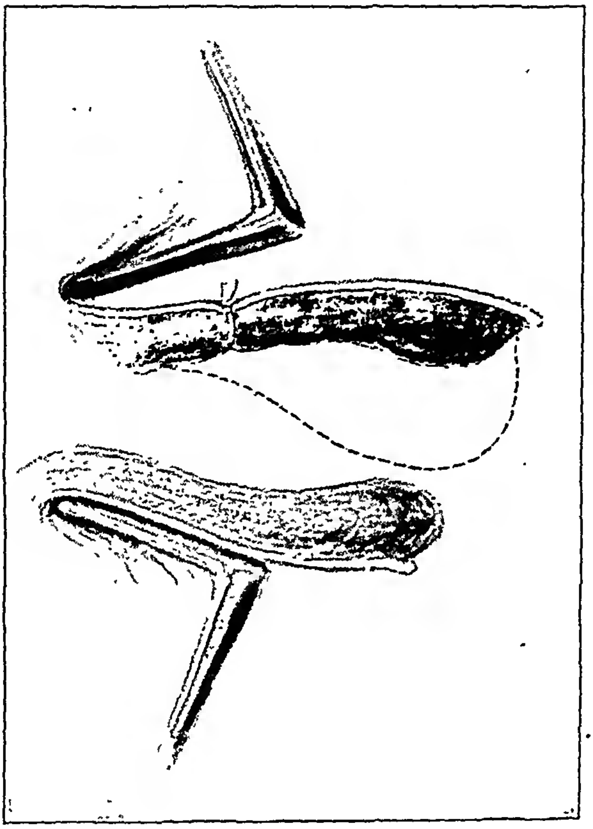

Fig. 6.—Suggestion for the repair of the condition shown in Fig. 5. The protruding mucosa is pushed up and sewed in place by a few catgut sutures.

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THE AMNIOTIC FLUID AND ITS QUANTITATIVE VARIABILITY

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IN OUR eagerness to solve those questions of obstetrics that deal with the immediate practical needs of our patient, we are apt to forget that until some of the more fundamental problems dealing with the physiology and physiologic chemistry of childbearing have been solved, we cannot make much progress. A good example of one of these still unsolved questions is the source and nature of the amniotic fluid, and the causes of its quantitative variability. It is surprising how little time has been devoted by American obstetricians to this and similar subjects.

The evidence on which the present article is based consists of the study of thirty-two cases of hydramnion, and one case of oligohydramnion, observed in my private practice and by the Obstetrical Department of Washington University since 1916. In all but four of these thirty-three cases sections of the placenta were available for microscopic study. In one recent case of hydramnion a considerable quantity of the fluid was obtained for chemical analysis. Special study was made of the histologic changes in the amnion and compared with the findings of about one hundred normal cases. In subsequent studies we hope to report further on the chemical consistency of the amniotic fluid and histology of the amnion and chorion in cases of normal or excessive amount of fluid.

Histologic studies, beginning with the work of Bondi,[1] Mandl,[2] and Forsell,[3] have indicated that the amnion is more than a slippery covering for the sac in which the embryo lies. The amniotic epithelium, especially that covering the placental site, has been shown to be cylindrical, with characteristics pointing definitely to a secretory function. Fat globules in large numbers have been found filling the protoplasm of the cells and lying in pockets in the subjacent connective tissue. The unusual duplications of amniotic epithelium occasionally found were carefully described by Dr. Richard Paddock,[4] of our Department, in a recent publication. Paddock found in some cases several layers of a high columnar epithelium, and in others there was a squamous type of pavement epithelium with keratinization resembling that found in the skin. In none of the ten placentas in which these changes were noted was there any association with hydramnion or oligohydramnion.

BIOCHEMISTRY OF THE AMNION

Numerous experimental and clinical observations have demonstrated conclusively that the amnion is not a mere filter allowing certain substances to permeate from the maternal circulation into the amniotic cavity, but that it performs a definite metabolic function. The manner in which this is effected, according to Bondi, is that the amnion cell extrudes in the form of a vacuole, that material that it does not need for its own nutrition, and that this vacuole empties itself into the amniotic cavity. The fact that certain substances can pass directly into the amniotic cavity without entering the fetal circulation points definitely to a metabolic function of the amnion. Wislocki[5] has shown experimentally that substances like trypan blue injected into the amniotic cavity can pass into the maternal circulation, and can also enter the fetal circulation through swallowing of fluid by the fetus, or by passing directly through the amnion of the cord to the fetal vessels.

The direct passage of substances from the mother into the amniotic cavity without entering the fetal circulation is evidenced by Ottow's[6] case of sulphuric acid poisoning. Zuntz and Wiener[7] found similar conditions after the injection of sodium-indigo-sulphate. Juelich,[8] in a case of acute yellow atrophy, found the placenta very icteric, the amniotic fluid somewhat colored, but the skin of the child free from icterus. Holtermann,[9] experimenting with methylene blue, found that this substance in human beings passed very rapidly into the fetal circulation. It was not, however, eliminated by the fetal kidneys into the amniotic cavity. Instead of this a colorless leucobase of methylene blue was found in the amniotic fluid, presumably as a by-product of the amniotic epithelium.

Lycopodium powder, made very fine by previous treatment with ether, was injected into the eggs of a chick at various stages of gestation by Vrbitch.[10] He found the granules in the stomach and bowels within from one to thirty hours after injection. With rabbits also, where lycopodium was injected after laparotomy into the amniotic cavity and the uterus removed twenty-four hours later, the granules were regularly found within the stomach and intestines of the fetus. Vrbitch concludes that such swallowing of amniotic fluid is a regular process in the last half of the gestation period.

The biochemical composition of the amniotic fluid has been given considerable study in recent years. In amount the normal range is between 500 and 2000 c.c. It is a clear fluid in the earlier months, but cloudy from mixture with vernix and lanugo in the later months. It is composed of 98.5 per cent of water and 1.5 per cent of solids. These solids consist of albumins, fats, ferments, uric acid and its derivatives, and various salts. Reinlein and Heinlein[11] analyzed eighty-six liters of amniotic fluid obtained from cows, making a special study for purin bases. They found benzoic acid, hippuric acid, and creatinine in small amounts; also histidin, methylguanidin, and a base isometric with tetanin. They conclude that the amniotic fluid contains a collection of the end-products of metabolism. Although these substances differ somewhat from those found in urine, the metabolic process seems very similar. Flössner and Kirstein[12] examined eight liters of human amniotic fluid obtained from normal cases without contamination, and found histidin, arginin, lysin, glycocol-betanin, sarcolactic acid, and aromatic oxyacids. Of special importance are the investigations of ferments in the amniotic fluid. These were carried on primarily by Polano[13] and his associates.[14] The presence of fat droplets in the amniotic epithelium and the tissues beneath it have long been noted. These are present in much larger amount in the free amnion than in that covering the placenta. Attention was directed by Polano to the presence of ferments in this portion of the amnion. In the amniotic covering of the umbilical cord these ferments are lacking. Of the proteolytic ferments he found a heterolytic, a peptic, a tryptic, and an autolytic ferment. Of ferments producing coagulation, he and his workers found chymosin and thrombase.

Interesting was the presence of a fat-splitting ferment, which, while it was found in both the placental amnion and the free amnion, was found in twice the quantity in the latter. This lipase, according to Kieffer,[15] has a definite function in the production of vernix caseosa. Recently, Maeda[16] found diastase in large amounts in the amniotic fluid and in the maternal blood, but very little diastase in the fetal blood. He concludes that diastase is produced primarily from the maternal blood. Lipase was found occasionally, and small amounts of pepsin, fibrin and chymosin, while trypsin was found in none of five cases examined. Polano considered the finding of these various ferments as conclusive evidence of the active functioning of the amniotic epithelium. In fact, he feels that the amnion may be regarded as a second line of defense between mother and child, serving to protect the latter from substances in the maternal circulation that may be toxic to so delicate an organism.

SOURCE OF THE AMNIOTIC FLUID

From the histopathology of the amnion, and these biochemical studies, there can be no reasonable doubt that the source of the amniotic fluid is the amnion itself, and that the theory held from the days of Hippocrates to the present century, that this fluid merely consists of fetal urine is unfounded. While it is true that in certain cases of absence of fluid, there is an absence of fetal kidneys, or a blocking of the fetal urinary passages, it is also true that normal amounts of fluid, and even hydramnion, have been found associated with these same anomalies. That a slight admixture with fetal urine may occur shortly before or during labor seems probable, but this admixture is inconsiderable and has no functional significance.

HYDRAMNION (REPORT OF 32 CASES)

While the source of the fluid seems reasonably certain, the factors influencing its quantitative and qualitative production are practically unknown. Of greatest interest is the quantitative overproduction of this fluid, or hydramnion. We must, of course, realize that this may be due either to excessive production or to excessive retention of fluid. It would appear that normally there is an outflow as well as an inflow, and that, just as in the filling of a bathtub, the accumulation may result from a combination of an excessive inflow and restricted outflow, as well as from either factor alone.

The thirty-two cases of hydramnion recorded in this series occurred in about sixty-five hundred confinements at Barnes Hospital, from 1916 to 1926, making an incidence of about one in two hundred. The average age of the thirty-two mothers was exactly thirty years, and pluriparity was strikingly frequent. There were only five primiparas and twenty-seven multiparas, with an average of *five* children for each mother. The fact that normally, according to Lehn,[17] the average amount of amniotic fluid in multiparas is 1200 c.c. compared with 1000 c.c. in primiparas, would indicate that the relaxation of the abdominal walls and uterus in the pluriparous women tends mechanically to permit more readily the accumulation of fluid within the uterine cavity.

Pregnancy records of these mothers reveal few complications except those due to a crowding of the diaphragm by the accumulating fluid in the abdomen. In six instances labor had to be induced on account of the dyspnea thus occasioned. Three mothers showed a moderate amount of toxemia, and one had a definite diabetes. Of the twenty-three cases in which a Wassermann-Kahn test was made, only two showed evidences of syphilis. One mother had been tapped by her family physician for a supposed ovarian cyst, without apparent harm to her; although when she subsequently went into labor the child was stillborn and macerated.

Of complications of labor our series showed two instances of prolapsed cord, two transverse positions requiring version, and five cases of delayed labor requiring midforceps. In none was cesarean section indicated.

The children varied greatly in size. In spite of eight prematures, the average weight of the children was 3,350 grams, and eight of them weighed over 4,000 grams. In sex they were equally divided between boys and girls. Abnormalities of development consisted of six cases of anencephalus, and one child with syndactylism and a peculiar skinflap fixing the jaw down to the chest. This latter deformity doubtless interfered with any attempt to swallow, a point which will be later considered under the head of etiology.

In twenty-eight of the thirty-two cases sections of the placenta were studied. The careful saving and recording of this material by Dr. Otto Schwarz and his associates has made it possible to add important data, even though of a negative character to our knowledge of the placenta in hydramnion. Heretofore, such records have only rarely been available.

The most striking fact in our series was the large size of the placentas. They weighed on an average of 710 grams as compared with 500 to 550 grams for the normal placenta. In eight instances the placenta was unusually large weighing between 800 and 1100 grams. Abnormalities of length or insertion of the cord were not found. Of the various lesions outside of the amnion there was noted one case of a large angioma, one placenta circumvallata, two definite luetic placentas, two with cystic degeneration of the decidua, two with red infarcts, five with white infarcts, three with hematoma, one case of edema, and two cases with infection. Of these lesions the angioma could alone be held in a way responsible for the hydramnion.

Special attention was paid to the microscopic study of the amnion. These were compared with a large series associated with normal amniotic fluid. In only one-half of my cases, sixteen in all, was the amnion found in the sections; in the remainder it has been stripped off in imbedding or sectioning. These sixteen cases, however, showed no lesions that could with any definiteness be associated with the formation of the hydramnion. Twelve were entirely normal; of the remaining four, the lesions consisted of small areas of necrosis, areas of duplicated epithelium, and infection. Since these lesions were found in equal number in the group of amnions with normal amniotic fluid, no significance can be attached to them.

The amount of amniotic fluid in my cases varied between 2000 and 12,000 c.c. Of course, it is often difficult to measure the fluid accurately, but an approximation could usually be arrived at. There was but one case of typical acute hydramnion with sudden onset and extreme accumulation of fluid. Eight cases showed a moderate amount of fluid (2000-3000 c.c.), eighteen showed a large amount (3000-5000 c.c.), and six cases showed an extreme amount (over 5000 c.c.). In only one recent instance could a sufficient amount of amniotic fluid be obtained for chemical analysis. The history and findings were as follows:

Mrs. A. D. M. (private patient of Dr. McNalley), thirty-one years of age, five para, had had one tube and ovary removed two years previous to her present gestation. On account of persistent nausea and vomiting she entered Barnes Hospital in the eighth month of her pregnancy. Glucose was administered intravenously, but four days later she went into labor spontaneously. Four thousand cubic centimeters of amniotic fluid were present. An easy labor resulted in the expulsion of an anencephalic female monster weighing 1,750 grams. Seventeen hundred cubic centimeters of amniotic fluid were obtained uncontaminated for chemical analysis, and a small amount of fetal blood was also secured from the umbilical cord. An attempt to secure enough meningeal fluid for analysis was unsuccessful. The analysis of the amniotic fluid and fetal blood, made by Dr. Victor Gould, is shown in the accompanying table.

TABLE I

	HYDRAMNION FLUID	FETAL BLOOD
N. P. N.	14 mg. per 100 c.c.	33 mg. per 100 c.c.
Uric acid	10 mg. " " "	3.2 mg. " " "
Chlorides	700 mg. " " "	510 mg. " " "
Cholesterol	Trace	193 mg. " " "
	10 mg. " " "	
Sp. grav.	1.0063	
Ash	0.783%	
Total nitrogen	0.109 gr. per 100 c.c.	
Total protein	0.53 gr. " " "	
Total solids	1.565%	

These findings, as in the case of other investigators showed no material chemical difference between the fluid in hydramnion and in normal cases.

Attempting to analyze the etiology in our series of thirty-two cases, we were unable to find any clue at all in eight of them, 25 per cent. In the remaining twenty-four the following factors were tentatively held responsible:

6 Anencephalus
3 Twin pregnancies (two uniovular)
6 Large placentas
3 Unusually large children
1 Diabetes
2 Syphilis
1 Angioma of the placenta
2 Hypertension

GENERAL CONSIDERATIONS

While the type of hydramnion under consideration is that occurring toward the conclusion of pregnancy, it should be remembered that we may also meet with hydramnion in the early weeks of gestation. In a study of the cause of hematom-mole in 1902, I brought evidence confirming the hydramnion theory of Davidson.[18] These retained ovisacs showed a marked disproportion between the minute embryo and the large amniotic cavity, and in my view the accumulation of amniotic fluid or hydramnion, was a definite factor in the production of these peculiar blood moles.

A division into acute and chronic hydramnion has generally been made, but Marshall[19] calls attention to a third group that is not infrequent,—a chronic hydramnion with acute exacerbation. The typical case with tremendous accumulation of fluid in a short period of time is usually associated with uniovular twins. Experimental production of hydramnion has been reported by Bruno Wolff.[20] He removed both kidneys from pregnant rabbits and found within two days thereafter a marked increase of amniotic fluid. This hydramnion was especially noticeable if the rabbits were near term. From chemical analysis of the fluid he concludes that the amniotic fluid in these cases is due to a compensatory secretion of urine by the fetus. Wolff does not believe that his experiments will explain all forms of hydramnion, but that where urine-forming substances are withheld in the blood, the fetal organs take on an added function to eliminate them.

Less convincing are the experimental efforts to produce absorption of amniotic fluid. Commandeur and Baussillon[21] injected intravenously 50 c.c. of a 3 per cent sodium chloride solution. After eight injections in a patient with hydramnion, over a period of three weeks, they noted a diminished circumference of the abdomen from 97 to 94 cm. Such slight changes may, of course, be due to other factors.

A clinical diagnostic point of some value in hydramnion has been noted by Pischzek and Schmidt,[22] who made studies of the capillary circulation in pregnant women. Since the capillaries of the nailbed are similar to those of the inner organs, they were not surprised to find in three cases of hydramnion a marked capillary dilatation.

Habitual hydramnion has been noted in a remarkable case by Luettger.[23] Syphilis was not a factor in this case. After three normal children there were eight pregnancies as follows: fourth, hydramnion, with child dying in one hour; fifth, dead, macerated child; sixth, normal living child; seventh, normal, but child died in four hours; eighth, slight hydramnion, stillborn at eight months; ninth, hydramnion, macerated child; tenth, hydramnion, macerated child; eleventh, hydramnion, macerated child. The placentas of the last two pregnancies were very large, weighing respectively, 970 and 1040 grams. No deformity of the child, nor heart or kidney lesion of the mother were noted. Floris[25] has also recorded two instances of repeated hydramnion in the same mother.

Of clinical importance is the fact that a considerable number of women with extreme hydramnion have been operated on or punctured in the belief that an ovarian cyst was present. This also occurred in one of our cases. Fortunately, it does not often produce bad results, although most women go into labor after such a puncture. Henkel,[24] who recommended abdominal puncture of the uterus to evacuate a large portion of the fluid, has found little support among obstetricians. The danger of bleeding from trauma of the placental site is considerable, and the benefits, as recorded by those who have tried this procedure, are very slight and transient.

Such radical measures are particularly to be deprecated when we consider the perilous future of these hydramnion children. Floris,[25] who reported 236 cases of hydramnion (many of them only slight), found that while only 25 per cent of the children died at or before birth, 8 per cent died subsequently, but no mental or physical defects were found in these children later on. Of Poeck's[26] 136 hydramnion children at the Koenigsberg Clinic, fifty-six, or 40.4 per cent were found living and normal. He considers that the frequency of prematurity, faulty presentation and fetal monstrosities account for the immediate death rate, but that the ultimate prognosis of those that survive is good. Krahula[27] is very pessimistic about hydramnion children. Out of 72 cases he found 37.5 per cent with congenital deformities, and a primary mortality of 54 per cent. Of the remainder he found only 3 per cent living and normal after a period of time.

In my own series of thirty-two cases the incidence of deformities was 22 per cent, and the mortality, including two that died shortly postpartum, was 44 per cent.

ETIOLOGY OF HYDRAMNION

Hinselmann,[28] in Halban-Seitz's *Biologie u. Pathologie des Weibes,* gives a splendid summary of the various factors that may enter into the formation of hydramnion. Of first importance are deformities of the fetus. It would seem fairly certain that deformities of the fetus can be grouped into: (1) those that have no influence on the amount of amniotic fluid; (2) those that are associated with hydramnion or increased fluid, and (3) those that are associated with oligohydramnios or scanty fluid. Especially interesting is the incidence of anencephalus and those defects that interfere with swallowing, or that block the passage of fluid into the intestines, among the cases of hydramnion. Almost equally frequent is the appearance of oligohydramnios in children with defects of the urinary organs. Other forms, such as hydrocephalus, according to Lau,[29] are usually associated with normal amounts of amniotic fluid.

While there are exceptions in each group, the number of cases reported from various sources is so large that we must concede a definite relationship between the quantity of fluid and the type of deformity. This is particularly striking in the case of anencephalus, in whom it is reasonable to suppose that there is both an increased transudation of fluid from the meninges into the amniotic cavity, and an absence of swallowing of fluid by the fetus. Ample evidence has already been presented showing that such swallowing occurs normally in the latter half of pregnancy. The best evidence of this is the regular presence of lanugo hairs in the meconium of newborn infants. In controls that I recently made I found approximately from six to eight hairs in each cover-glass of meconium. In two of the anencephalic children in my series, however, where such an examination was made, not a single lanugo hair could be discovered, indicating that no swallowing had taken place. The absence of swallowing of amniotic fluid as a factor in hydramnion is further emphasized by such cases of those of Theron[30] (stenosis of the esophagus); Buecheler[31] (struma blocking esophagus); Cramer[32] (micrognathia compressing trachea and esophagus); Voron,[33] Hempel[34] and others (aplasia of duodenum); Kleinman,[35] Lotz[36] and Schmidt[37] (five cases of stricture of esophagus). My own case of a fibrous band connecting jaw and chest should also be included in this group, although the findings could not be confirmed by autopsy. On the other hand, it is also true that occasionally normal amounts of amniotic fluid are found with stenosis of the small intestines, but Schmidt believes that in such cases enough fluid is absorbed by the stomach to permit an outflow by the fetal circulation.

Next in importance as an etiologic factor is twin pregnancy. Clauditz[38] found in forty-five cases of hydramnion, eleven instances of twin pregnancy, seven of which were uniovular. In 1876, Schatz[39] pointed out the tendency to polyhydramnion in one twin and oligohydramnion in the other. Randall[40] reports a case of uniovular triplets and hydramnion. In all reports of hydramnion from 10 to 20 per cent are associated with uniovular twins. In Benthin's[41] case the heart of the twin with excessive fluid was decidedly larger than the heart of the other; while the kidneys were of the same size in both. Apparently the hydramnion in these cases is due to circulatory conditions in the placenta not as yet clearly understood. In Goldschmidt's[42] case of acute hydramnion and uniovular twins he found areas of necrosis in the amnion epithelium which he held responsible for the condition. I doubt this interpretation since in one of the cases of uniovular twins in my series in which the amnion was preserved, no such necrosis was to be seen, the amnion being normal in all respects.

Forsell in his microscopic studies of the amnion in cases of hydramnion, lays special stress on the absence of a vesicular secretion in the amniotic epithelium in these cases. He argues that these vesicles are an indication of the outflow of fluid from the amniotic cavity to the mother via the amnion. When these cells were absent, this outflow could not occur and hydramnion developed. This speculation has not been supported by the observations of others and it is certain that in my sixteen hydramnion cases compared with a large number of normals, no such morphologic differences in the epithelium could be observed.

Unusual size of the children and placentas has been noted by many observers especially as a factor in the hydramnion of moderate degree. Fellner[43] found in a large series a direct proportion between the length of the child and the amount of amniotic fluid. This was a striking factor in my series. It is fair to assume that with unusually large placentas in lax-walled, multiparous women, the accumulation of a large amount of fluid might readily ensue.

Toxemic conditions of the mother form another group. In the presence of edema, hydramnion is not rare. Poeck found it a factor in 10 out of 136 cases. Syphilis may also be, to some degree, responsible for hydramnion, largely because it produces stasis in the placental circulation. In my own series, however, the incidence of syphilis was not more than we would naturally expect, nor have I found elsewhere definite proof of its etiologic relationship to hydramnion. The tendency to hydramnion in diabetes is much more definite. In the patient in my series unfortunately no examinations were made for sugar in the amniotic fluid or fetal urine. She had 4 per cent sugar three weeks antepartum and the amount of amniotic fluid collected was 2700 c.c. Offergeld[44] found dextrose in the fetal bladder urine at birth and attributes the hydramnion in part to fetal polyuria. Hinselmann[28] believes that the increased fluid in these cases is the physical result of the passage of sugar into the amniotic cavity corresponding to the tendency to edema in diabetes. He thinks that in the early stages suitable dietetic treatment may limit the development of hydramnion.

Finally, we must point out the association between hydramnion and circulatory conditions in the fetus and placenta. Alfandry[45] reports a case of malformation of the fetal heart, with anasarca and placental edema. More frequent is the association of angioma of the placenta with hydramnion. Hinselmann[28] gives a list of fifteen cases of angioma of the placenta associated with excess of amniotic fluid. He believes it due to the greater amount of the secretory surfaces in these cases. In the one case of angioma in my series of cases, an additional factor in the hydramnion may have been a deformity interfering with the swallowing of amniotic fluid.

OLIGOHYDRAMNION

Much rarer, but of equal interest, is the study of those cases with a deficiency or almost complete absence of fluid. The diagnosis will not be easy or certain unless the patient has been closely observed throughout her labor, but in the more extreme cases of oligohydramnion the clay-like consistency of the amniotic fluid, and the characteristic pressure deformities of the child leave no doubt as to the correctness of the diagnosis. A very striking instance of this condition came under my observation in 1920. The history was as follows:

Mrs. L. L., thirty-two years of age, married four years, was six weeks pregnant at the time of her first consultation, Dec. 3, 1920. She had had some slight irregular bleeding with cramps for two weeks previously, but under rest and codeine a miscarriage was averted. Confinement was due July 13, according to her menstrual history. During July the breech was down but not engaged in the pelvis.

The uterus was strikingly small and an attempt to correct the breech presentation was found impossible. There seemed to be little, if any, fluid in the uterus.

Fetal movements were felt only faintly. On August 7, twenty-four days after the expected date of confinement, labor was finally induced with repeated small doses of pituitrin. The breech entered the pelvis and complete dilatation was effected in sixteen hours. There was no bag of forewaters, and when the membranes were ruptured barely an ounce of fluid escaped. The fetal heart was good until the beginning of the second stage, but the child, a boy weighing 2800 grams, died during delivery which was not especially complicated. The child showed marked evidence of compression. Both ears were flattened out against the head, resembling the ears of an elephant. There was a pronounced curvature of the spine, and the lower extremities were curved in accordance with the shape of the uterus, with the feet markedly clubbed. In addition to this a moderate degree of hypospadias was present. Autopsy was not permitted, so that the question of internal anomalies of the urinary tract could not be determined. I have since confined this mother of two other children with normal amniotic fluid, and both children are living and well.

The placenta in this case was very small, measuring only 13 by 10 by 4 cm. The cord was 44 cm. long and attached 1 cm. from the margin. The maternal surface was unusually pale; one portion showed a hematoma 1 by 0.5 cm. in area. Numerous small infarcts were found on microscopic section. Of special interest were the changes in the amnion. This showed the epithelial layer broken into bits, with a few cells crowded together between flattened amorphous masses, that were probably remnants of necrotic epithelium. Over a considerable area, not over one-third of the amnion, cells were found intact. Whether this change in the amnion was primary and responsible for the absence of fluid, or whether it was secondary and due to pressure and scratching of the amniotic surface by the fetus, is difficult to say.

Vorlaender[46] found necrosis of the amnion in all three of his cases. Where any epithelium was found, it showed degenerative changes (vacuolization). He suggests that the permeability of the amnion after epithelial necrosis leads to a flow of fluid from the amniotic cavity to the maternal circulation.

In recent years attention has been called, especially by Neumann,[47] to the incidence of urinary deformities of the fetus with oligohydramnion. In forty-nine cases, it occurred nine times. Meyer-Ruegg[48] reports a case in which scantiness of fluid occurred in three successive pregnancies. Hürzeler[49] (3 cases) and Bertkau[51] found absence of kidneys in the fetus.

The occurrence of scanty amniotic fluid in cases of cholera has been noted and must be explained on the basis of an absorption of fluid by the mother from the amniotic cavity. According to Ahlfeld,[50] the absorption of amniotic fluid occurs normally in retained abortions, in twin pregnancy when one fetus has been compressed and ceased to develop, and in ectopic pregnancy that has gone to full term. Ahlfeld says we must assume either a primary absence of secretion of fluid or an absorption of fluid later in pregnancy. The absence of any amniotic bands or adhesions points, in his opinion, to the latter assumption. Further studies of the placenta and amnion in these cases will, in his opinion, help to solve this riddle.

The clinical characteristics of oligohydramnion may be summarized as:

1. Proportionately small size of pregnant uterus.

2. Greater frequency among primiparas.

3. Tendency to breech presentation, in which position the fetus adapts itself more closely to the shape of the partly filled uterus.

4. Prolonged pregnancy (from 20 to 30 days overdue).

5. Long, slow labor, with frequent necessity for manual or instrumental interference.

6. High fetal mortality during and after labor.

SUMMARY

1. Recent studies, especially biochemical analysis of membranes and amniotic fluid, point definitely to a metabolic function of the amnion.

2. While the source of the amniotic fluid is with reasonable certainty to be interpreted as the amnion epithelium, the causes of its quantitative variation in the form of hydramnion and oligohydramnion are still unknown.

3. Certain types of deformity in the fetus are associated with hydramnion, and other types with the absence of fluid. Malformations are very common in both groups.

4. No histologic changes in the amnion or chemical changes in the amniotic fluid in the cases of hydramnion have been found to explain its occurrence.

5. Necrosis of the amnion in cases of oligohydramnios is rather constant and may be an etiologic factor.

6. Unusually large placentas are found as a rule in hydramnion. Possibly the increased surface for secretion explains the increased fluid in these cases.

7. There is definite evidence of the physiologic swallowing of amniotic fluid by the fetus and the absorption of this fluid by the fetal intestines resulting in its return to the maternal circulation. When this outlet to absorption of amniotic fluid is blocked by some hindrance to deglutition or a stricture of the upper digestive tube, hydramnion results with striking frequency.

8. Twin pregnancy, more often uniovular twins, are often found, as a factor, especially in the acute forms of hydramnion.

9. Clinically, the prognosis for the child is bad in both groups; for the mother it usually means a complicated, but ordinarily not a dangerous labor. There is some tendency to repetition of the condition in the same person.

10. The predominance of primiparas in cases of oligohydramnion and of pluriparas in cases of polyhydramnion indicates that the physical resistance to expansion of the uterus by the abdominal muscles is of importance in the amount of fluid accumulation.

REFERENCES

(1) *Bondi:* Zentralbl. f. Gynäk., 1905, p. 1073. (2) *Mandl:* Ztschr. f. Geburtsh. u. Gynäk., liv, part 3. (3) *Forsell:* Arch. f. Gynäk., 1912, xcvi, 436. (4) *Paddock:* Am. Jour. Obst. and Gynec., 1924, viii, No. 5. (5) *Wislocki:* Publication Carnegie Institute Nos. 274 and 276, Anat. Rec., 1921, xxi, 1. (6) *Ottow:* Cited by Hinselmann, p. 281. (7) *Zuntz and Wiener:* Arch. f. Gynäk., 1881, 17, 23. (8) *Juelich:* Klin. Wchnschr., 1925, iv, 2337. (9) *Holtermann:* Zentralbl. f. Gynäk., 1924, xlviii, 2536. (10) *Vrbitch:* Compt. rend. Soc. de biol., 1924, xci, 604. (11) *Reinlein and Heinlein:* Ztschr. f. Biol., 1924, lxxxi, 283. (12) *Flössner and Kirstein:* Ztschr. f. Biol., 1926, lxxxiv, 510. (13) *Polano:* Ztschr. f. Anat. u. Entw., 1922, lxiii, Part 5. (14) *Russmann:* Ber. u. d. ges. Gynäk. u. Geburtsch., 1924, iii, 1-9. (15) *Kieffer:* Gynec. et Obstet., 1926, xiv, 1-20. (16) *Maeda:* Biochem. Ztschr., 1924, cxliv, 1. (17) *Lehn:* Ztschr. f. Geburtsh. u. Gynäk., 1916, lxxviii, 671. (18) *Taussig:* Arch. f. Gynäk., 1903, lxviii, 258. (19) *Marshall:* Jour. Obst. and Gynec., Brit. Emp., 1914, xxv, No. 4. (20) *Wolff, Bruno:* Arch. f. Gynäk., 1904, lxxi, 224. (21) *Commandeur and Baussillon:* Bull. Soc. d'obst. et de gynéc., 1924, xiii, 659. (22) *Pischzek and Schmidt:* Zentralbl. f. Gynäk., 1926, l, 578. (23) *Luettger:* Monatschr. f. Geburtsh. u. Gynäk., 1922, lix, 35. (24) *Henkel:* Zentralbl. f. Gynäk., 1921, p. 841. (25) *Floris:* Monatschr. f. Geburtsh. u. Gynäk., 1923, lxiii, 55. (26) *Poeck:* Monatschr. f. Geburtsh. u. Gynäk., 1923, lxiii, 203. (27) *Krahula:* Monatschr. f. Geburtsh. u. Gynäk., 1921, lv, 199. (28) *Hinselmann:* in Halban and Seitz, Biol. u. Path. d. Weibes, vi, 263-307. (29) *Lau:* Zentralbl. f. Gynäk., 1921, p. 923. (30) *Theron:* Brit. Med. Jour., 1926, i, 652. (31) *Buecheler:* Aertzl. Prakt., 1897. (32) *Cramer:* Monatschr. f. Geburtsh. u. Gynäk., 1913, xxxviii. (33) *Voron:* Lyon. med., 1904, rev. in Hinselmann, p. 293. (34) *Hempel:* Jahrb. f. Kinderh., 1873, cited by Schmidt. (35) *Kleinman:* Inaug. Diss., Bonn, 1924, cited by Schmidt. (36) *Lotz:* Inaug. Diss., Giessen, 1900, cited by Schmidt. (37) *H. K. Schmidt:* Monatschr. f. Geburtsh. u. Gynäk., 1926, lxxii, 1. (38) *Clauditz:* Inaug. Diss., 1923, rev. in Zentralbl. f. Gynäk., 1925, p. 2735. (39) *Schatz:* cited by Hinselmann. (40) *Randall:* Am. Jour. Obst. and Gynec., 1924, viii, 766. (41) *Benthin:* Monatschr. f. Geburtsh. u. Gynäk., 1914, xxxix, 564. (42) *Goldschmidt:* Ztschr. f. Geburtsh. u. Gynäk., 1924, lxxxvii, 551. (43) *Fellner:* Monatschr. f. Geburtsh. u. Gynäk., 1900, xvii, Part 3. (44) *Offengeld:* Ztschr. f. Geburtsh. u. Gynäk., 1906, lviii. (45) *Alfandry:* Bull. et mém. Soc. anat. de Paris, 1924, p. 129. (46) *Vorlaender:* Zentralbl. f. Gynäk., 1926, p. 998. (47) *Neumann:* Zentralbl. f. Gynäk., 1922, p. 1564. (48) *Meyer-Ruegg:* Zentralbl. f. Gynäk., 1916, p. 830. (49) *Hürzeler:* Zentralbl. f. Gynäk., 1921, p. 702. (50) *Ahlfeld:* Ztschr. f. Geburtsh. u. Gynäk., 1906, lvii, 67. (51) *Bertkau:* Zentralbl. f. Gynäk., 1921, p. 1099.

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TOXIC GOITER IN ITS RELATION TO THE GYNECOLOGIC PATIENT

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GOITER is frequently found in Michigan and its management must necessarily receive much attention from our surgeons. Especially is toxic goiter in its several clinical forms the subject of consideration, and as in other intricate fields, it is necessary that we spend much time and study on this particular phase of the subject in order to maintain a high standard of results and a low mortality. What we are pleased to call toxic goiter, however, is by no means confined to our section of the United States. Although perhaps less frequent, it is nevertheless a problem everywhere. In its less apparent and milder manifestations it is, I believe, frequently overlooked by those whose contact with the disease is small. A fairly large experience with it during the past twenty years, running parallel with a gynecologic practice has led me, therefore, to present this paper.

I shall consider the matter under several headings. What relation has toxic goiter to the functions of the pelvic organs and how far is toxic goiter caused or modified by gynecologic conditions? In the examination of the gynecologic patient, what symptoms or conditions should lead us to determine the presence or absence of the disease? With what other conditions is it apt to be confused and how may we distinguish them? When the presence of toxic goiter has been established, how may it affect our treatment of gynecologic conditions? What treatment of such a goiter should be advised by the gynecologist?

For the purpose of this paper I have included under the term "toxic goiter" all pathologic conditions of the thyroid gland which give rise to, or are definitely associated with certain familiar symptoms. I have made no particular attempt to consider separately its several clinical forms. As is already well known to you they are: a high metabolic rate, loss of weight, certain heart conditions associated with a rapid pulse, tremor, an enlargement of the thyroid gland, nervousness, exophthalmus, and certain vasomotor disturbances. They vary in constancy and appear in varying degrees. One or several may be absent. Each may well receive a considerable study to determine its significance in diagnosis, prognosis, and treatment. There are many cases in which the disease is so well covered, or mild, or its manifestations caused by other conditions, that without much study one may easily be led into error. There are some that in spite of it leave one in doubt.

I am not considering here pregnancy and its relation to toxic goiter, nor am I concerned with the ovary in its relation to the thyroid or other endocrine glands. I am speaking only of toxic goiter. As far as the pelvic functions are concerned, we find no very close relationship. Women with toxic goiters occasionally have short periods of amenorrhea, otherwise their pelvic organs seem to behave about as usual. My observation would indicate that none of the various pathologic conditions found in the pelvis is influenced to any extent by toxic goiter, nor do such various pathologic conditions cause or influence toxic goiter. There seems to be no question but what certain infections have a part in the causation, but I have never found those of the pelvis acting in this capacity. We have made no extended investigation as to sex relations, but such patients do not complain to us in regard to these matters and we have hesitated to inquire . It is to be noted that but few of them become pregnant during the period of invalidism. In our experience also, toxic goiters do not occur oftener during the menopause than at other periods of adult life. It is rare in childhood, becomes frequent at about the age of twenty and continues to manifest itself up to an advanced age.

In the examination of his patient what symptoms or conditions should call the attention of the gynecologist to the possibility that she may be suffering from toxic goiter? First, a perceptible enlargement of the thyroid gland. Routinely, I think, every such patient should be examined for toxicity. If the patient has an adenomatous gland special attention should be directed to the heart for any evidence of myocardial degeneration. So commonly does such degeneration follow a gland of this type that surgeons are now commonly advising their removal in any woman over twenty-five years of age. An absence of apparent enlargement means little or nothing; toxic goiter frequently occurs without it. Again, every woman of whatever age who presents signs of myocardial weakness—fibrillation, dilatation, or both—is frequently suffering from toxic goiter. A loss of weight of say more than ten pounds, not otherwise easily accounted for, is another reason for suspecting this disease. There are few conditions that cause the great losses of weight that we meet with here (forty to sixty pounds is not extraordinary and twenty to thirty pounds is a common thing) though a slight or no loss is not a rarity. Nearly all toxic goiter patients have a good appetite and eat well, but lose weight in spite of it.

The rapid pulse which is so apt to be the first symptom to arouse our suspicious demands some little comment. In toxic goiter patients we should distinguish between the pulse rate under rest and under stimulation. A marked characteristic of the disease is that the pulse rate increases when the patient is stimulated. A slight degree of excitement, such as that produced by examination or the taking of the metabolism test, or the greater excitement, say of an approaching operation, increases the rate often to an extraordinary degree. It is a fair measure of the degree of increased excitability exhibited in this disease. Exercise and surgical operations also cause an increased rate. The pulse rate is less important than the condition of the heart and is not a true measure of the seriousness of the case. As characteristic as the increased rate is the pounding, tumultuous action of the heart. It is very seldom met with in other conditions and only simulated by some of the heart lesions. In mild cases it may not be outspoken and in patients with rigid thoracic walls or emphysema it may be covered. As a symptom, however, it is one of the most constant and reliable signs that we have. A rapid heart is occasionally absent; one should not be deceived thereby. When, not suspecting any goiter toxicity, we perform a gynecologic or other operation, and obtain a pulse rate strikingly increased over what was expected, during operation or afterwards, we should suspect toxic goiter and search for other evidences of it. An increased systolic blood pressure with a low diostolic is characteristic of the disease. When combined with a rapid pulse it has distinct diagnostic value. Estimates of the systolic, diastolic, and pulse pressures are of even greater value as a guide in the conduction of the case.

Tremor in varying degrees is, as a rule, present. Its intensity is apt to vary with the degree of excitement. Usually the tremor is a fine one, but not always, especially in some of the more pronounced cases. It is most easily detected in the hands, though it usually extends over the body. It is a symptom which occasionally gives the clue to the diagnosis.

Vasomotor disturbances are flushing of the skin, especially of the head and neck, sweating, and a sense of unusual warmth. This sense of unusual warmth reminds one of that experienced during the menopause. As a rule, however, it is more uniform and less likely to come in waves. One of the most constant symptoms of toxic goiter is moist, warm hands. A mild thirst may be found, on questioning, to be present when vasomotor symptoms are prominent. They are very apt to be absent in the milder or atypical cases.

The nervousness which distinctly belongs to toxic goiter and is a part of the disease is of one type—a more or less constant feeling of tension and a desire to keep going. It reflects the increased excitability which is such an extremely important factor. It varies in intensity from that of the normal individual to great restlessness, mental excitement, and occasionally mania. The emotions are easily disturbed; women are occasionally depressed, but in the early stages, at least, these patients seldom remain so. Increased excitability may be the symptom to arrest the attention of the examiner. Increased fatigability and weakness are almost constant symptoms and cause much distress. In fact, they often bring the patient to the physician.

How may one differentiate toxic goiter from other conditions simulating it? Tuberculosis, so often associated with loss of weight and a rapid pulse should give us no trouble. A basal metabolism test settles the question in doubtful cases. The same may be said of pelvic infections of long standing. The so-called neurocirculatory asthenia may give rise to some difficulty. There is increased fatigability and weakness. The emotions are easily disturbed. The anxiety and depression are not always entirely dissimilar. The pulse is rapid and the apex beat forcible; the tachycardia disappears during sleep which is not the rule with toxic goiter. The loss of weight is not excessive. The hands are more or less cold and clammy (an important diagnostic difference), and the metabolic rate is not disturbed. With care the two conditions should rarely give us any trouble.

Far greater difficulties are presented by the nervous patient whose heart action is easily disturbed, and who is emotional, has tremor under excitement, and is easily fatigued. Under rest the rate usually returns to 90 or less and distinctly neurotic symptoms are usually in evidence. A metabolism test is our chief dependence and with increased experience we are less apt to be in doubt, but our most difficult problems come in this class.

We not infrequently see patients who are distinctly neurotic and yet have mild or even a greater degree of goiter toxicity. We may often distinguish the manifestations of the one from the other. Patients that impress us as being overstimulated and who have one or more suggestive manifestations of toxic goiter but a metabolism test within the normal, we are apt to classify as "potential goiter." We have observed a few that later displayed distinct goiter toxicity. Eyes that are slightly staring should be included among the symptoms that suggest the disease.

The basal metabolism test is the best single aid that we have, and we use it in every doubtful case. In a general way an elevation of less than twenty is doubtful, and unless other symptoms are well pronounced we do not operate. With patients, however, who have adenomatous glands we are apt to advise operation if they present any signs whatsoever of toxicity. A bruit over the thyroid is pathognomonic of toxicity, but in my experience is not present in the great majority of cases. The same may be said of exophthalmus.

When the presence of goiter toxicity has been established, how may it affect our treatment of gynecologic conditions? It goes without saying that no gynecologic operation is going to affect toxic goiter favorably nor is the removal of tonsils or other foci of infection of any particular value. We have found them utterly undependable.

Unless the gynecologic condition is urgent, we should defer operation until the toxic goiter has been corrected and the patient returned to a nontoxic state or, at least, almost so. Plastic operations are the best examples of this. If the gynecologic operation is urgent, the mildest procedure possible to remove the crisis temporarily should be resorted to. A major pelvic operation in the presence of toxic goiter of even mild severity is made far more critical than it otherwise would be. If the gynecologic operation is very necessary, but can be deferred for a week or more, the use of Lugol's solution (m. x, t. i. d.) with bed-rest may help to make the operation less critical.

How may we advise patients with toxic goiter? In the past prolonged bed-rest and sedatives was the most frequent method of treating such patients. At present it should be reserved for only the mildest and the doubtful cases. For all of the outspoken, the severe cases, and almost all of even the mildest, operation is by all means preferable. It is the most powerful means we have of controlling the disease and of placing the patient at once on the road to recovery. With greater experience in estimating the surgical limitations of a patient, with better technic, and the use of Lugol's solution, with bed-rest in the hospital, preliminary to operation it has become a comparatively safe procedure. A preliminary ligation is sometimes best even today, and the removal of the gland in two sittings may sometimes be done for the sake of safety. In the great majority of instances, however, a double lobectomy, leaving but little of the gland, may be performed. The mortality all told in operated cases compares favorably with that of our gynecologic cases and is very low. Patients with extreme restlessness and excitement and who do not improve under bed-rest and Lugol's solution and those who are maniacal are best not operated upon, but the percentage of such is small.

The use of Lugol's solution as a treatment for toxic goiter is not to be recommended. The improvement is of short duration and it removes one of the surgeon's chief reliances at the time of operation. It should be reserved for use before operation and perhaps afterwards. The use of the x-ray and radium is not advisable. The improvement, if it occurs at all, is slow, often only temporary, and the results are less certain than operation.

I do not wish to convey the impression that operation is ideal. Almost without exception patients do improve after operation. They regain their weight and their other symptoms improve. Most of them are completely restored to health within a few months or a year. Some of them, however, show signs of toxicity for a very long time and a few must necessarily be reoperated. Recurrences after years are unusual, but they do occur. One of the most remarkable results of operation is the restoration of badly damaged hearts, but a few seem to suffer a certain amount of permanent injury.

GRAND RAPIDS CLINIC.

THE TREATMENT OF PLACENTA PREVIA BY PROPHYLACTIC BLOOD TRANSFUSION AND CESAREAN SECTION

By Arthur H. Bill, M.D., Cleveland, Ohio

As one glances over the recent literature of placenta previa, he must be impressed with the fact that while the most disastrous methods of treatment have been largely eliminated from practice, there has otherwise been very little change in the general attitude of the medical profession toward these cases. To be sure the practical elimination of the accouchement forcé has reduced the present day mortality considerably, but with the exception of the cases treated by this method the average maternal mortality of twenty years ago was as low as it is today, namely, 10 per cent or more in all cases and about 25 per cent in cases of central placenta previa alone. Placenta previa continues to be one of the most serious problems of obstetrics.

Death from placenta previa is usually due to postpartum hemorrhage. Seldom does death result in a case undelivered and in which no intrauterine manipulation has been performed.

There are two underlying factors in the etiology of postpartum hemorrhage in cases of placenta previa: (1) the condition of the patient at the time of delivery, and (2) the method of delivery.

The problem of the treatment of placenta previa is about as clear cut as any problem in obstetrics. It is solely one of hemorrhage and the treatment resolves itself into, (1) the replacing of lost blood to the patient, and (2) delivering the patient in such a manner as will cause the least loss of blood during delivery and the least danger of postpartum hemorrhage.

In practically all discussions of the treatment of placenta previa, attention is given solely to the relative merits of the numerous operative procedures which have from time to time become popular, the accouchement force, Braxton-Hicks version, bag, placental forceps, vaginal hysterotomy and abdominal cesarean section. Too little consideration is given to the fact that the amount of blood which has been lost by the patient previous to delivery is quite as important as the method of delivery and has a very definite bearing on the ability of the patient to withstand the delivery and on the problem of postpartum hemorrhage which is in most cases the cause of death.

In this connection let me emphasize the fact that in cases of postpartum hemorrhage, a definite vicious circle may be established inasmuch as the loss of blood may be sufficient to cause atony of the uterus, while the atony causes further hemorrhage. The atony of the uterus may even be such that uterine packing will have little effect in controlling bleeding. Such a uterus will not respond to drug stimulation; in fact, the only hope of breaking the vicious circle thus established lies in blood transfusion. The effect of blood transfusion in producing uterine contraction is very remarkable. However, when the patient is in such a state of shock that the uterine muscle has entirely lost its contractile power, the question of restoring this function is sometimes problematical. No one wishes to be confronted with such a problem. The longer we practice the more surely must we be convinced that the only dependable treatment of postpartum hemorrhage is that of prevention.

There is no doubt whether that in the past there has been too great haste in delivering patients with placenta previa. Physicians have been so impressed with the idea that in the presence of antepartum hemorrhage the uterus must be emptied that they too often resort to a method of delivery when the patient has no chance whatever of surviving it. No attempt is made to determine whether or not an additional loss of several hundred cubic centimeters of blood, which must surely take place in any method of emptying the uterus, will be sufficient to send the patient into shock, or if you wish, establish the vicious circle previously mentioned. There must be greater deliberation to meet the requirements of the case in hand.

We would urge the more general use of the prophylactic blood transfusion, that is, transfusion given previous to the delivery so that the danger of postpartum hemorrhage from atony of the uterus may be avoided. Our experience has shown conclusively that if sufficient blood is given by transfusion before the delivery the type of postpartum hemorrhage just described will seldom occur.

Inasmuch as the patient may continue to lose blood it is of course important that there shall be no prolonged interval of time between the blood transfusion and the delivery. The ideal manner of carrying out this procedure is to have two teams in action, one for the transfusion and one for the delivery. While in most cases the two procedures are performed almost simultaneously it is our rule not to commence the delivery until the greater part of the blood has been given and in the most serious cases we take time to estimate the patient's condition after the first transfusion and thus determine whether or not she will require a second transfusion before the delivery. Estimation of the patient's ability to withstand the delivery is based upon the history and observation of loss of blood, the general appearance and apparent condition of the patient, and above all the blood pressure and the red blood count. No patient is delivered who has a red count below three million and a blood pressure below 90 to 100 systolic and 60 diastolic, until blood transfusion has been given.

Blood transfusion in obstetric practice is largely an emergency procedure. Haste is usually required and therefore such accuracy as will insure against the slightest delay which may arise from errors in technic. We, therefore, consider this procedure to be one highly specialized and worthy of the services of one member of the staff who has devoted much time to the perfection of details, not only of the technic of the transfusion itself but of blood reactions. Thus at the Cleveland Maternity Hospital, blood transfusion is under the direction of Dr. W. R. Barney, whose painstaking study of the possibilities and also the dangers of transfusion, and whose perfection of the technic have been of inestimable value in the development and success of our present policy.

In the delivery of cases of placenta previa there is a very noticeable tendency to adhere to the so-called conservative methods. By the conservative method is invariably meant delivery through the pelvis with the aid of the bag. This method of delivery with its slow dilatation is undoubtedly more conservative than the accouchement force, but has it stood the test? Is it really conservative? It certainly has not been the means of reducing the mortality to a degree which is at all gratifying. To be sure, in many cases in which the bag has been used the mortality was due to the fact that blood transfusion was not performed. However, it may be said that in some cases the fatality could be attributed directly to the method of delivery. Deep tears in the cervix may be, but unfortunately are not always, avoided by this method, but whether the cervix be torn or not, the placental site of the uterus is stretched and traumatized to some extent.

If the placenta is situated in the lower segment and over the os, there is enough muscular tone in that segment to control bleeding if the os remains closed and there is no trauma of the placental site. Evidence of this is seen in the clinical fact that after cesarean section for placenta previa there is no additional danger of postpartum hemorrhage when the uterus contracts well. However, in many cases in which the os has been dilated and the area of placental attachment has been stretched or torn, the insufficiently contractile lower segment of the uterus is unable to cope with the additional hazard and there is postpartum bleeding even though the fundus seems to be firm and in some cases even though there is no apparent tear in the cervix. (The condition seems somewhat similar to that which has been described as a paralysis of the placental site.) There is the greatest degree of postpartum safety in those cases in which the lower uterine segment has been left undistended and there has been practically no dilatation of the os.

Some years ago my attention was called to this fact by a case which is not in the list of cases reported with this paper. I shall mention it briefly.

Marginal placenta previa. Voorhees bag inserted, controlled bleeding perfectly and dilated the cervix. Fetal head followed the bag into the cervix and also controlled bleeding until it had passed through the cervix. Low medium forceps delivery. Cervix inspected and no tear observed. Postpartum hemorrhage. Uterus and vagina packed with gauze. Subcutaneously packing did not control hemorrhage. Saline given also intravenous saline with adrenalin. Preparation made for blood transfusion. Patient died before transfusion could be given. Cause of death was undoubtedly bleeding from the placental site.

In the article on placenta previa by Brodhead and Langrock in the January 1927, number of *Surgery, Gynecology and Obstetrics,* I noted two similar cases in the list of fatalities which I quote, as follows:

CASE 7.—A multipara at term with central placenta previa was treated by a de Ribes bag and version. Because of the parity of the patient, the use of the bag followed by version was the conservative plan of treatment. This patient bled to death because of continued hemorrhage from the placental site, which might have occurred even though cesarean section had been the procedure chosen. At autopsy no cervical laceration or uterine rupture was found.

CASE 9.—An viii-para at term with central placenta previa was treated by version. The case was unfavorable in that she had bled profusely before admission to the hospital. Although a conservative podalic version was done, there being no further hemorrhage during delivery, the patient died of continued bleeding from the placental site. A postmortem revealed an intact cervix and uterus.

These cases are, I think, typical of what may happen when a method of delivery is used which requires dilatation of the cervix. To be sure, this sort of hemorrhage is seen in only a small percentage of the cases so delivered, but certainly occurs in enough of them to account for a considerable number of the deaths which are reported. It is not seen in cases delivered by cesarean section. Why then do we continue to use the more complicated and more treacherous methods of delivery through the pelvis instead of the more conservative abdominal cesarean section?

If one were to analyze critically any list of fatalities from placenta previa, he could write across the histories of a large number of them the words, "Should not have been delivered without blood transfusion." Across the histories of nearly all the rest he could write, "Should have been delivered by cesarean section."

The accompanying table is a summary of the cases of placenta previa treated at the Cleveland Maternity Hospital.

I have divided them into two series, one previous to January 1, 1922, and the other from January 1, 1922, to the present time, because, during the time covered by the latter series, there was a somewhat more definite practice of making use of the prophylactic blood transfusion in cases of severe hemorrhage. While simultaneous blood transfusion and cesarean section were first performed by us in 1912, in the latter series a more careful estimation was made of the patient's condition to determine the advisability of transfusion. During this

SERIES A. CASES PREVIOUS TO 1922

45 cases delivered	Central placenta previa			23
	Marginal placenta previa			22
Method of delivery	Cesarean section			27
	Bag and podalic version			17
	Forceps			1
Maternal deaths 5 or 11.1 per cent	1. On 13th day. Intestinal obstruction (?)			
	2. Hemorrhage, no transfusion			
	3. Hemorrhage, no transfusion			
	4. Hemorrhage, transfusion after cesarean section			
	5. Hemorrhage, 3 postpartum transfusions			
Fetal mortality	Stillborn	8	17 or	37.3%
	Died	9		

SERIES B. CASES SUBSEQUENT TO 1921

56 cases delivered	Complete placenta previa			25
	Partial placenta previa			10
	Marginal placenta previa			21
Method of delivery	Cesarean section			40 Cases
	Podalic version			11 "
	Forceps			4 "
	Spontaneous			1 "
Prophylactic blood transfusion and cesarean section				12 "
Maternal death			1 or	1.78%
Fetal mortality	Stillborn	10	18 or	32.1 %
	Died	8		
Cases requiring blood transfusion				12.4 %
Cases delivered by cesarean section				71.4 %

period, therefore, transfusion was not used as a measure of last resort but as a means of precaution where there was the least doubt as to the patient's ability to survive delivery.

In Series "A" one of the maternal deaths was due to an abdominal complication which possibly could not have been avoided. The other four deaths, however, were due to postpartum hemorrhages and could very likely have been prevented in view of our subsequent policy of prophylactic blood transfusion. In Cases 2 and 3 no blood transfusion was given, while in Cases 4 and 5 blood transfusion was performed after the delivery when there was found to be profuse postpartum bleeding on account of atony of the uterus.

Undoubtedly there was too great haste in delivering these patients without preliminary blood transfusion and the loss of blood caused by the delivery so depressed the patient that the uterus entirely lost its contractile power; so much so that even blood transfusion did not restore it. These cases show that the patient needs the greatest stimulation from transfusion at the time when the uterus is emptied; that there may be an immediate contraction of the uterine muscle which will prevent further loss of blood. They also illustrate the futility of blood transfusion in some cases when given after the patient is much exsanguinated.

Series "B" represents the results of our present plan of treating placenta previa. The first cesarean section for placenta previa which I performed was at the Cleveland Maternity Hospital in 1907. The contrast between this method of delivery and the methods which I had previously used, namely, the accouchement force and later the Voorshees bag, was so striking that I published an article in the *Cleveland Medical Journal* advocating cesarean section as the best method of delivery in cases of central placenta previa and well-marked partial placenta previa. There were very few cases in the literature at that time and of course my argument in favor of cesarean section was not based upon any statistics of my own but upon the underlying principles involved. For some years afterward we performed cesarean section in the cases of complete placenta previa and in those in which the placenta overlapped a considerable part of the os, while the cases of lesser degree were treated by what we then erroneously thought to be the more conservative method of delivery through the pelvis. A realization of the danger of uncontrollable postpartum hemorrhage due to disturbance of the placental site even though there was no apparent tear in the cervix, as before discussed, gradually led to a more definite policy of performing cesarean section as a procedure of choice and really as a conservative procedure. Thus, in all cases of placenta previa whether central or marginal in which the cervix is practically undilated, cesarean section is now performed. This plan is based largely on the principle that the closed os and undisturbed placental site are most important factors in the prevention of postpartum hemorrhage in such cases.

The smaller number of cases in which cesarean section is not performed consists of those of lateral placenta previa in which the patient has been in labor, the os is considerably dilated, and the fetal head has descended sufficiently to control the hemorrhage by pressure.

No vaginal examinations are made in cases of antepartum hemorrhage. The diagnosis is based upon the history, the apparent bleeding, abdominal palpation and auscultation, and rectal examination. The elimination of vaginal examination and manipulation undoubtedly has been a most important factor in the reduction of maternal mortality. It is of course apparent that the differential diagnosis between central and marginal placenta previa is often not made before, but during operation. However, when cesarean section is performed it makes no difference which variety is present, the result being equally good in each. Postpartum hemorrage is rarely encountered when the condition of the patient is suitable for delivery, that is, when she has retained or has been given sufficient blood to insure uterine contraction. The uterus is not packed after cesarean section.

Prophylactic blood transfusion seemed to be indicated in about one-fifth of the cases. These naturally include the most serious cases. One typical case will serve to illustrate the possibilities of this method.

A multipara was brought to the hospital after a very profuse antepartum hemorrhage. Radial pulse could not be felt. Blood pressure could not be recorded. Blood count showed 1,500,000 red cells. Extreme pallor and air hunger. Transfusion of 500 c.c. of blood was immediately given. A fair radial pulse could then be felt. Blood pressure 80 systolic, while diastolic pressure was too low to be recorded. Red blood count 2,400,000. Patient still unfit for delivery. A second transfusion of 500 c.c. of blood was given and cesarean section performed just as the transfusion was completed. After the second transfusion the red blood count was 3,100,000, and the systolic blood pressure was over 100. There was no postpartum hemorrhage and the patient made an uncomplicated recovery.

The single death occurred late in the series, there having been fifty-three consecutive cases with no mortality. This case furnished more than a surgical problem. The husband of the patient absolutely refused permission to deliver or transfuse. He would not even allow typing of himself for use as a donor. Only after several hours of arguing and pleading and finally the demand of a priest, was permission given. The patient was practically moribund at that time. Two transfusions amounting to 1200 c.c. of blood were given and the patient was delivered by cesarean section. For one hour after delivery her condition seemed satisfactory with no evidence of hemorrhage. Then there was a sudden relaxation of the uterus with uncontrollable hemorrhage and death before a third transfusion could be given. It is evident that this patient could have been saved had delivery been performed when preparation was first made, five hours before the actual delivery. Two procedures could be suggested which might have prevented death even after the long delay. First in a case in which the patient is so nearly moribund before the transfusion it might be well to ligate the uterine arteries at the time of delivery. Second, in any case of postpartum hemorrhage, or a case in which there has been severe antepartum hemorrhage, the blood pressure should be taken postpartum at least every five minutes until the danger of hemorrhage is definitely passed, so that if there is a falling pressure another blood transfusion can be given before it is too late. A falling blood pressure is often the first evidence of bleeding during this period.

In conclusion emphasis should be laid upon the fact that while cesarean section is our method of choice in delivering cases of placenta previa, no method of delivery is safe in the more serious cases without prophylactic blood transfusion.

OSBORN BUILDING.

SURGERY VERSUS RADIOTHERAPY IN THE TREATMENT OF TUMORS OF THE UTERUS

By G. Brown Miller, M.D., F.A.C.S., Washington, D. C.

IT SEEMS to me that the time has come when gynecologists should have fairly well-defined views concerning the employment of surgery or radiotherapy in the treatment of fibroid and malignant tumors of the uterus.

To form an intelligent consideration of the relative indications and contraindications of the two methods of treatment we must bear in mind several facts. Some of these are the following: surgery has stood the test of time to a much greater degree than has radiotherapy. We know by experience that as time goes on the value of a supposed cure of disease as a rule, decreases, and its harmful action on the human organism is found to be greater than was thought. One has only to recall the various operations in surgery or the advent of certain drugs to have this fact brought vividly to his recollection. We hail a supposed cure with enthusiasm, expect the impossible, gradually grow skeptical of its beneficial effect, grow more suspicious of its harmful action, and frequently, finally discard it as worse than useless.

Surgery has gone through this trial and we have today quite definite knowledge of what it can accomplish, as well as to the objections to its use in the treatment of these tumors. In the case of radiotherapy there is quite a different picture. Its accomplishments for good or for evil are not nearly so well defined. There is no reason to think that radium or x-ray has any selective action on the cells of fibroid tumors or carcinomas. Kayserling and others have shown that the action of radium upon normal cells is exactly the same as it is upon carcinoma cells. The difference in its effects upon various tissue depends upon the stability, as it were, of the tissue. Its effects in the treatment of fibroid tumors of the uterus depends chiefly upon its action on the ovary by destroying its function and producing the menopause. Geller showed in rabbits that the so-called stimulation of small doses of radium, etc., for bleeding at the establishment of puberty instead of stimulating the ovary caused degeneration of this organ. In cancer the conclusions of Martin ten years ago are still logical, i.e., that there is no proof that any form of radio activity has any selective action on cancer or any other cells. The only difference is that cancer cells are more easily destroyed than most normal tissue cells. There is a maximum intensity of radiation which, when it is just reached, cancer cells are destroyed, and connective-tissue cells in a measure are injured, while normal epithelium of the uterus is not injured. If this intensity is exceeded all the normal tissue in the neighborhood is injured or destroyed, while cells at a considerable distance may be stimulated to increased growth. (This last statement has apparently been demonstrated by several German observers, but it is questionable whether or not it is true.) We have never had a clear-cut conception as to what dosage is best, how long we must apply the agent, how long the interval should be between the applications, and what kind of application least injures the neighboring tissues. While this view will be modified as our experience grows, the application of radiotherapy is, and will probably remain, to a large degree empiric. The intensity of action of radium or x-ray varies inversely as the square of the distance. In trying to reach a deep-lying tumor the intermediate tissue is bound to be affected by it, and tumor cells at a great distance may possibly be stimulated to more active growth. We must remember also that intensive radium or x-ray applications cause changes in the blood (decrease in the red cells and hemoglobin and a temporary leucocytosis). That the mucosa of the small intestine is very susceptible to the action of these agents has been demonstrated by Warren and Whipple, Yugenberg, and others. Warren and Whipple state: "There can be little doubt that the small intestine can be injured by roentgen-ray therapy in human beings, and it is certain that such injury is serious." "We know," they say, "that roentgen-ray skin burns or ulcers are very chronic and we are able to state without reservation that the intestine can be so injured by the roentgen ray as to produce ulcers that are no less chronic than the familiar skin lesions." Yugenberg and others have shown that while the stomach is not very susceptible to the action of x-ray, that the small intestines are markedly so, comparatively small doses producing ulceration. The vitality of tissues is affected by x-ray and radium, produced probably by injury of the endothelium of the blood vessels, and when preoperative applications of these agents are made there may be interference with the healing of wounds. We are all familiar with x-ray and radium burns and sloughs. One of my patients who was given intensive x-ray treatment for a large fibroid tumor had at operation the most vascular and extensive adhesions of the intestines and omentum to the tumor; the operation was followed by sloughing of the skin and fat of the abdomen, and she developed a vesicovaginal and rectovaginal fistula. I think it beyond question that these untoward results were due to the intensive x-ray treatment prior to operation. We frequently see marked nausea and diarrhea following radiotherapy, and bloody stools and death have apparently resulted occasionally from its application over the abdomen.

Bagg and Little (*American Journal of Anatomy,* March, 1924) confirmed the observation of others that healthy mice known for generations to produce healthy offspring, when subjected to irradiation before mating, frequently produced abnormal offspring and that when the offspring of irradiated mice are bred together there may appear abnormalities in subsequent generations which by properly selected breeding may involve all the offspring. Healy says that experimental data upon the lower animals have shown that when the sex glands are sufficiently irradiated before fertilization that the following are aypical fetal reactions: (1) disturbed, abnormal, arrested development resulting in the formation of monsters, etc.; (2) a marked tendency to a progressive loss of fertility, and (3) a specific modification of hereditary mechanism and the production of inherited defects in the young, especially in the eyes. Irradiation during pregnancy produces disturbed, arrested, abnormal development with death of the embryos, absorption or abortion, stunting in growth, cataract, sterility, lesions of the central nervous system and blood vascular disturbances in the embryos.

A number of cases in human beings have been reported showing that similar results can be expected with them. An editorial in the *Journal of the American Medical Association* says, "It would seem on the basis of existing returns that the actual danger of developmental defects from irradiation of childbearing women is not so great as to constitute a contraindication for this form of therapy for condition in which it is seriously needed, but the potential danger is real enough to discourage irradiation when the indications for its use are not urgent or when the prospects of actual benefit are at all doubtful."

Case and Warthin have noticed changes in the liver indicating that general applications of radiotherapy, especially those over the abdomen, are apt to result in serious liver damage. It is entirely probable, they say, that postirradiation sickness is as much due to hepatic as to intestinal damage. They continue: "There is an additional general sensitiveness of some patients to radiation. Cachetic persons bear it badly, but in addition there are some persons who bear it badly although they have not developed cachexia."

Thus we see some of the dangers of the use of radiotherapy. While it may be claimed that these effects can be minimized by proper precautions, it must be apparent that we are dealing with agents whose powers for evil are not fully known and whose potential dangers are such that we must give them our earnest consideration before they are employed.

Another consideration of great importance is that radiotherapists are not always competent gynecologic diagnosticians. Even experts can make mistakes. Pregnancy may be mistaken for a fibroid tumor, extrauterine pregnancy for the same, while pus tubes, tumors, and abscesses of the ovary, cancer of the sigmoid or rectum have all been mistaken and treated for fibroids. When an operation is done the results of mistakes are not so serious, for the true condition is discovered as soon as the abdomen is opened and before valuable time has been lost or any great harm been done. Accurate diagnosis is a prerequisite for the use of radiotherapy.

Some of the objections urged against surgery are the mortality of the operation, and the morbidity due to adhesions, hernias, and the dread of the operation. The mortality in the uncomplicated cases of fibroid tumors is practically nothing. During my work in Washington I can recall but two deaths following operations for these tumors. One was due to suppression of urine in a woman, one of whose kidneys had been destroyed by pressure of the large growth. The operation was very long and difficult. The other death was due to peritonitis caused by a pelvic infection present when we operated. It had been recognized and the operation was delayed several weeks. The patient was losing ground and the operation was done as a forlorn hope. I have not looked up the number of cases operated upon, but the mortality is a very small fraction of 1 per cent. Clark and Bock, in 267 cases of fibroid tumor operations, had a mortality of 0.7 per cent and in 169 uncomplicated cases the mortality was nil. They truly say that the mortality of operation in uncomplicated cases is rapidly approaching the vanishing point. Adhesions do result fairly frequently, but seldom do they rise to disagreeable symptoms. They can be largely avoided by careful suturing and gentle handling of the abdominal viscera during operation. Herniae should not occur. The dread of an operation certainly prevents a number of women from submitting to it even when it is urgently needed. This, in my opinion, causes more women to submit to radiotherapy than any one thing.

With this information at hand let us see which cases of fibroid tumors should be treated by surgery and which by radiotherapy. The cases to be treated surgically are large tumors, cases where a myomectomy can be done especially in pedunculated tumors, tumors in comparatively young women, submucous tumors, tumors complicated with other pelvic conditions requiring operation, rapidly growing tumors, tumors giving rise to pelvic pain, the presence of a marked secondary anemia not accounted for by uterine bleeding, and myomas in very nervous women. The cases in which radium or x-ray therapy is indicated are those women near the menopause who have profuse periods, where there are either no tumors present or where they are small, and where it has been demonstrated by curettage that carcinoma of the body of the uterus is not present. In borderline cases the presence of a serious lesion of the heart, lungs, kidneys, or a very pronounced anemia may decide in favor of radiotherapy. There are, however, very few cases of heart disease where operation is contraindicated.

The heart condition usually is markedly benefited by the removal of the tumor if it is of considerable size. Almost the same may be said regarding anemias. Most cases require operation and it is seldom that an anemia is so pronounced that an operation is contraindicated. I have operated upon patients with a hemoglobin of 20 per cent or less and have had no bad results. Indeed at times when a woman is flowing freely the operation, if an easy one, is the quickest and best way to stop the flow. I no longer regard a moderate anemia as a contraindication to operation.

In large tumors the menopause does not usually cause so great a shrinkage of the growth as to make us hope for amelioration of many of the symptoms produced by the tumor, such as a pressure on the ureters, bladder, intestines, blood vessels, the increased work thrown upon the heart, and the inconvenience caused by the size and weight of the tumor. The induction of the menopause may cause a certain amount of decrease in size of large growths, but it is too uncertain to be depended upon. In the early days of gynecology when operators were afraid to attempt the enucleation of these large tumors they practiced the removal of the ovaries, hoping thus to reduce their size. This practice has practically been abandoned. These large growths are prone to undergo degenerations, at times, malignant. They sometimes become infected and frequently cause omental and intestinal adhesions. Some think they cause degeneration of the heart muscle. Therefore, the removal of these tumors is strongly indicated.

In cases where a myomectomy can be done in comparatively young women it gives them a continuance of menstrual life and a hope of childbearing. Last year I delivered three young women upon whom I had done a myomectomy not in any case more than two years prior to the delivery. One was sterile and promptly conceived after the operation; one had a small fibroid in a previous pregnancy which grew to be a large one in a few years. The third woman had a myomectomy done during a pregnancy. She miscarried, but was delivered of a healthy child some eighteen months later. It seems to me that it is evident that in the young women a myomectomy or the removal of a portion of the whole of the body of the uterus is preferable to the sterilization of the woman with x-ray or radium. At times a portion of the uterine body, which allows menstruation, can be left. Even where the whole of the body of the uterus is removed the retention of the ovaries prevents the advent of the premature menopause with its disagreeable symptoms.

In submucous fibroid tumors it can be readily understood that the tumors are prone to undergo degeneration, infection, necrosis, etc. I have seen a few cases of complete inversion of the uterus caused by a submucous tumor. Radium or x-ray tends to increase the danger of necrosis. The consensus of opinion of all writers is that these tumors should be removed

It is self-evident that, where one finds these tumors along with some other pelvic condition requiring a laparotomy, radiotherapy cannot be considered. It might be noted here that quite frequently in doing a laparotomy for a fibroid tumor, one discovers a tumor of the ovary or some other abnormality of the pelvic or abdominal viscera requiring operation. In a considerable number of cases where a hysterectomy has been done for a fibroid tumor, upon opening the cavity of the uterus one discovers a carcinoma of the body. In rapidly growing tumors the suggestion is sarcomatous degeneration, hemorrhage, necrosis, etc. Tumors which give rise to pelvic pain are often associated with chronic inflammation of the adnexa, or adhesions, and it is advisable to remove such growths. According to Clark and Keene a marked secondary anemia, not caused by hemorrhage, is suggestive of degeneration of the tumor and should be treated by removal of the growths.

In women nearing the menopause with small tumors where a curettage does not remedy the condition and does not reveal a carcinoma, radiotherapy is indicated. The strongest indication for its use is in those patients with adenomyoma of the rectovaginal septum where a removal of the growth is attended with great danger; the production of the menopause by x-ray, radium, or operation (the removal or destruction of the ovaries) will as a rule cause a cessation of the symptoms. I have had a case where x-ray applications gave apparently permanent relief. Where there are large tumors of the uterus or tumors of the ovaries accompanying the growth in the septum, operation is indicated.

My opinion then is, that in fibroid tumors of the uterus, surgery is the choice in the great majority of the cases. Where radiotherapy is used the diagnosis of the condition should be made by a competent gynecologist. Many women who have these tumors require no treatment. They should be under observation, however, and should there be evidence that the tumor is causing symptoms its removal is indicated. Since the mortality from operation is so small and the chances of trouble being caused by the tumors considerable, the tendency, on my part, is toward the enucleation of the tumor before it reaches a large size or causes pronounced symptoms.

In cancer of the uterus it is not so easy to differentiate between the cases in which one or the other method is indicated. The poor result of operation before the advent of the Wertheim method in cancer of the cervix and the high immediate mortality of this operation deterred many gynecologists from operating on these patients. The time consumed in doing the Wertheim operation is a factor in a trial of the substitution of x-ray or radium in their treatment. My experience in operating on patients with cancer of the uterus has been such that in all cases hopeful of the complete removal of the growth I strongly believe that operation is the best treatment. My percentage of cures in cancer of the cervix operated upon is more than 40 per cent. In my private cases it is over 60 per cent. A number of the ward cases have been lost sight of and as these have been classed as failures it brings the percentage of cures much lower than it would otherwise be. The percentages of the cures by Wertheim, Peterson, Cobb, and Graves are respectively 42.5, 47.3, 57.1 and 34.1 per cent. The number of my Wertheim operations have not been large (not more than 25 to 30), but I have had no immediate mortality. I attribute this to my modification of it which lessens the loss of blood and shortens the time required to perform it. It seems to me that the present trend of opinion is toward operation in all hopeful cases. However, many believe that radium should supersede operation in cancer of the cervix.

A great many authors are apparently chary of expressing an opinion on the subject. A paper in *Radiology* by Burnam and Neill of the Kelly Clinic indicates that the views in this clinic have materially changed. In early cases of cancer of both cervix and body of the uterus they advise hysterectomy unless there is some strong contraindication. In borderline cases they advise hysterectomy when possible, the operation in both early and borderline cases to be followed by radiation in cancer of the body and preceded by it in cancer of the cervix. In inoperable cases they advise radium. They say that x-ray has no place in the treatment of these cases except as a palliative measure in the more advanced ones. Nearly all observers are agreed that hysterectomy is the treatment of cancer of the body of the uterus. So far as I can tell the present status of the question should be as follows: In all hopeful cases of cancer of the body of the uterus a complete hysterectomy should be done. The prognosis of these cases is very good, the majority of them being cured. In advanced cases there is no cure, and radiotherapy may be tried as a palliative procedure. In cancer of the cervix where the growth is apparently confined to the cervix the Wertheim operation should be done, followed by the application of radium. The very best statistics are those where this method is used. Scherer claimed that 48 out of 58 cases treated by this method were free from recurrences at the end of three years.

In borderline cases the same treatment is applicable unless the general condition of the patient is poor, when radium is preferable. In advanced cases of cancer of the cervix where the bladder is not involved radium is the treatment. One should not, however, delude his patient with a hope of cure; it fosters quackery on the part of the radiologist. Care should be taken in these cases that the application of radium is not excessive. I have seen several women whose suffering has been markedly exaggerated and whose lives were considerably shortened apparently by the intensive use of radium. Marked bladder and rectal symptoms made them utterly miserable.

Some believe that in cancer of the cervix where an infection is present the application of radium unfavorably influences the infection and hastens the death of the woman by causing general infection or a cystitis and pyelitis.

In view of the fact that the application of radium or x-ray during pregnancy is apt to cause anomalies of development in the fetus, these agents should never be used in the treatment of uterine tumors in pregnant women.

In conclusion I would say that I think instead of advocating the abandonment of operative procedures in cases of cancer of the cervix our endeavor should be to so perfect the operative technic that more cases can be treated in this manner. It has not been shown that radium is superior to operation when the operator is skillful. Practically every case of cancer of the body of the uterus should be operated upon. In cases of fibroid tumors operation is the better treatment in nearly all cases where the services of a competent gynecologist can be secured.

1730 K STREET.

A STUDY OF THE EFFECTS OF BLOOD TRANSFUSION IN OBSTETRIC AND GYNECOLOGIC CONDITIONS

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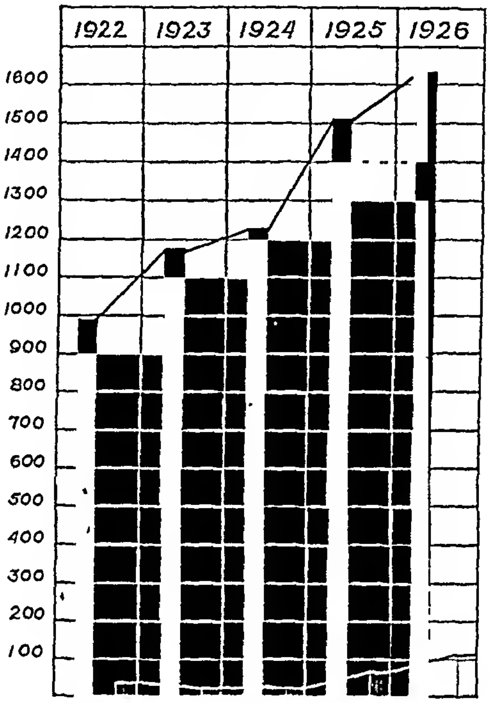
THE IMPORTANCE of direct blood transfusion as a therapeutic agent and as a life saving measure cannot be denied. It is therefore in an effort to arrive at a keener appreciation of some of its indications, limitations, and dangers, that this study was undertaken. For the result of our surgical audit must always be the basis for technical and therapeutic improvement as well as the indication for discard.

While it is not probable that this review will result in contributing anything new or startling to the subject of blood transfusion, we believe that we will be able to demonstrate that direct blood transfusion has a wider field of usefulness as a prophylactic and curative measure than any one remedy in our armamentarium; and that by its more general employment within the realm of obstetrics and gynecology, if the cases in which it is used are properly selected, the mortality and morbidity may be materially reduced.

This study is based upon 6539 admissions to the obstetric and gynecologic service of the Long Island College Hospital from January 1, 1922, to January 1, 1927, and necessarily includes patients suffering from almost every type of acute or chronic lesion affecting the female generative system. Fig. 1 shows the gradual but constant increase in the number of admissions ranging from 922 in 1922 to 1632 in 1926, approximately an increase of about 125 patients a year. This increase in the census was only made possible, as there has been no addition to our bed capacity (the obstetric and gynecologic unit consists of 102 beds—public and private), by a greater turnover and a shortened convalescence. The factors which have contributed to this accomplishment are (1) *greater detail in the preoperative care.* Our staff has agreed in both clinic and private practice to use every available means for improving the general condition of the woman prior to having her admitted to the hospital for operation. This plan, of course, is limited to those applying for care who are suffering from subacute and chronic lesions such as the traumas of childbirth, pelvic inflammations, benign tumors, etc., in which time and local treatment have a beneficent effect. Such patients have their preoperative preparation done in the office and clinic and are



YEAR	CASES	TRANSFUSIONS
1922	992	33
1923	1176	20
1924	1229	20
1925	1510	67
1926	1632	116

Fig. 1.—Showing increase in census of Long Island College Hospital and incidence of transfusions.

taught such rules of hygiene, rest and diet as will make them better operative risks. On the other hand, in those conditions in which the patient has sustained considerable blood loss, or is dehydrated, as may occur in ectopic pregnancy, placenta previa, ablatio, bleeding fibroids, etc., the individual resistance has been augmented by preoperative transfusion or transfusions and by intravenous infusions of glucose.

(2) At the time of operation every effort is made to minimize the amount of anesthetic used by preliminary "twilighting" with morphine and scopolamine, or if the amnesia and analgesia are sufficiently profound, the operation is done with local infiltration. Furthermore, an attempt is made to shorten the procedure as much as is consistent with good surgery, absolute hemostasis and the maintenance of perfect asepsis. All postoperative cases receive during the first twenty-four hours intravenous injections of glucose and from 1000 to 1500 c.c. of saline solution given subcutaneously.

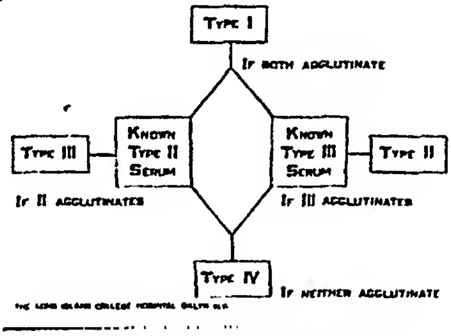


Fig. 2.—Diagram showing how matching may be simplified.

(3) By hastening the woman's recovery with fresh air, sunlight, and artificial light—we have found all of these agents raise the hemic content, increase the appetite and improve the woman's well-being. If, however, notwithstanding the employment of these agents the hemoglobin percentage remains below 50, the patient is transfused before leaving the hospital.

Methods of matching.—All of the transfusions given in this series have been grouped according to the Moss classification, and before any blood is given, it is rematched and cross matched directly with the cells and serum of the recipient. Each case has been grouped and matched by the interne and rechecked by the resident physician immediately before the transfusion was given. A schematic diagram (Fig. 2) shows how blood matching may be simplified.

Incidence.—By referring again to Fig. 1, it will be seen that the transfusions in 1922 show an incidence of one in every thirty patients; while in 1926 the relation is one transfusion in every fourteen admissions. Prior to 1922 the citrated blood and the Lindermann multiple syringe methods of transfusion were used, but since that date each patient has received direct blood transfusion by the Unger or the Soresi technics. In all, 260 transfusions have been given, which would make an incidence of nearly 4 per cent, yet upon further analysis we find that these 260 transfusion operations were done on 164 different patients; the smallest number given to any patient was one, and the largest number of repeated transfusions was eleven.

Mortality.—Only one patient in this series died as the result of injecting blood. This woman should not have been transfused; her death was due to an error in election. She had a fibroid tumor of the uterus, which as a result of continued menorrhagia had produced a very severe secondary anemia complicated by a poorly compensated heart. She had the symptoms of decompensation a few days before receiving the transfusion—sufficient significance was not attached to this fact; and though but 200 c.c. were given, the load was too great for her myocardium—the right heart dilated and she died of a pulmonary edema.

Reaction.—There were no reactions to transfusion when the blood was given in cases of acute anemia, or where it was given as a prophylactic measure in the preoperative preparation of patients with a secondary anemia, or in the three cases of pernicious vomiting of pregnancy treated by blood transfusion. On the other hand, there were sixty cases or 23 per cent in which there were varying degrees of reaction. All of these patients were suffering from some form of infection, in none were the reactions particularly severe. Some few complained of chilliness, temperature rise and acceleration of pulse. These reactions cannot be attributed to any defect in matching, for all patients were grouped, matched, and finally cross matched directly with cells and serum of the recipient; and if on rematching, the serum of the recipient clumped any of the cells of the donor, the rule has been followed, "If in doubt, don't give it." Yet on repeated occasions we have found in septic cases, in some of the toxemias of pregnancy, and in the severe secondary anemias of splenic origin that the biochemistry changes from time to time and very speedily; for after grouping and matching, on the final cross match which is done immediately before the blood is given, it has been noted that the serum of the recipient will clump some of the cells of the donor. This was illustrated in one woman of Type 4, who was grouped and then directly matched with 12 donors and though they all belonged to Group 4, her serum clumped the cells of every one. In line with this observation we have the record of another interesting case: a woman suffering from a severe preeclamptic toxemia; this patient was of the same type as her husband and yet their bloods refused to match; later, however, after the baby had been delivered, her blood pressure had been reduced and her condition improved, their bloods matched perfectly with no agglutination whatever.

These observations not only explain a large percentage of reactions met with in septic cases, but justify the dictum "if in doubt, don't give it"; and further demonstrate the value of the teaching that in all forms of sepsis and toxemia *the matching and rematching should be done immediately before the introduction of the blood,* as the biochemical changes in the serum and cell content are constantly changing with the variations in temperature, pulse and tissue oxidation.

Clinically we have found that when the transfusion was given during temperature remissions and when the injection was preceded by a hypodermic of morphine and scopolamine that the severity of the reaction was markedly reduced.

The size of the transfusions.—The average amount of blood injected has been 386 c.c.; the largest amount of blood introduced at one time was 800 c.c.; this was given to a case of acute anemia from hemorrhage due to placenta previa. Several small transfusions of 100 c.c. have been given and repeated in cases of infection with poor myocardia. On further analysis of these cases we find that 77 transfusions were done in the course of the treatment of infections during the acute stage. These include cases of postabortal fever, infected, incomplete abortions, puerperal metritis, parametritis, pelvic abscess, pyelitis, postoperative parotitis, thrombophlebitis and bacteremia. It is among these 77 that the large proportion of our reactions have occurred. Seventeen injections were given to make up for the blood loss in obstetric interpartum and postpartum bleeding; two were done to decrease the coagulation time in severe puberty hemorrhage resulting from endometrial hyperplasia, while the remaining 74 were employed for preoperative and postoperative conditions which required that the patient's resistance should be increased in order that she might be made a better surgical risk.

These conditions are illustrated in the menorrhagias and metrorrhagias of fibroid tumors which had produced a secondary anemia and that chain of tissue changes which occur as a result of a low hemic content, or in women recovering from long continued local infection with well defined foci ready for enucleation. These patients usually present a secondary anemia, low blood pressure, poor heart muscle and the general signs of asthenia. Transfusion in such cases changes the picture. Twenty-four of our cases fall in this class; there were four ectopic pregnancies in women entering the hospital with a hemoglobin percentage of less than 30 per cent who were transfused on the operating table. These women made good recoveries from their operation, yet in spite of feeding, sunshine and tonic treatment, they failed to regain their normal blood state. Postoperative transfusions in each of these patients resulted in a most happy change.

Hyperemesis of pregnancy.—The advantage of blood transfusion in the treatment of hyperemesis was an accidental observation with us some six years ago in dealing with a most intractable case of pernicious vomiting, who in spite of isolation, hypodermoclysis, corpora lutea injections and intravenous glucose infusions, continued to vomit and to go from bad to worse; her urinary output was diminished to 300 c.c. per day; her pulse rose to 140; the blood pressure fell to 80/50; there were acetone, diacetic acid and lucin bodies in the urine. On consultation it was decided that her only hope was evacuation, but her condition was so bad that we felt she would die on the table; so as a preoperative measure we transfused her with 400 c.c. of blood, and to my surprise within twenty-four hours the entire picture had changed. The pulse slowed, the pressure rose, her urinary output increased and the vomiting ceased.

In this series there were three women suffering from hyperemesis of pregnancy in whom intravenous glucose, subcutaneous infusion and proctolysis failed to raise blood pressure, to increase the urinary output and to check the vomiting. These women were transfused with 350 c.c. of blood without reaction and promptly ceased vomiting, increased their urinary output, raised their blood pressure and had their well being improved.

As a preoperative procedure.—Patients who have been ill a long time, with or without persistent blood loss, and show varying degrees of anemia, slow clotting time, and low blood pressure with high pulse rate, are improved by the introduction of fresh human blood. Illustrations of the type of patients in this series were women suffering from chronic pelvic inflammatory disease, submucous myomata, gall bladder disease with biliary obstruction, carcinoma of the ovary, carcinoma of the uterus, pyelonephritis, Banti's disease of the spleen, etc. All these women would certainly have died had the necessary surgery been undertaken without improving their surgical resistance by transfusion.

Observations on the effect of transfusion upon the blood picture.—When 300 c.c. of fresh whole blood has been introduced in nonseptic cases, the rise in the red cell count has averaged an increase of 481,266 cells. When, however, the woman was suffering from a blood stream infection, no rise was noted following the first transfusion; the pulse, however, has always been slowed and the blood pressure raised; unless the patient's condition has grown progressively worse, a second transfusion three or four days later has invariably raised the red cell count and the hemoglobin percentage. Rise in the latter has been greatest where the introduction of blood has been used to combat acute hemorrhage or as a prophylactic procedure in poor risk nonseptic cases. The average rise in all cases was 10 per cent. In some of our septic groups the hemoglobin reading was even lower following transfusion than it was before the new blood was given. This has been accounted for in two ways: if the drop was slight (say, 1 or 2 points), it may be attributed to personal error in reading. On the other hand, when the drop has been considerable, it could usually be accounted for by the fact that in spite of the transfusion the patient's condition had become progressively worse. The effect on the white cells has been variable and has depended largely upon the clinical course of the disease or the condition for which the transfusion was given. The ratio between the leucocyte count and the polymorphonucluear percentage acted as a prognostic index in a number of cases. Where there was a continued rise in both white cells and "polys," the disease had usually become progressively worse. On the other hand, when the white cells showed a marked increase following the introduction of blood and the "polys" remained stationary or showed evidence of a drop, the clinical condition invariably showed coincident improvement; and when there was a drop in the white cell count to a leucopenia the prognosis was always bad.

We may draw therefore from this small series the following conclusions:

1. That the introduction of blood in properly selected cases is relatively safe, although it is not without danger.
2. That it raises the pressure, slows the pulse, increases the body functions, acts as a food, and stimulates the blood forming organs to the production of new blood cells.
3. That it has a wide field of usefulness in cases other than blood loss, particularly in increasing the resistance of the septic woman.
4. That as a preoperative agent it improves the resistance and makes the woman a better surgical risk.
5. That its effect on the blood picture except in acute hemorrhages is only that which results from improving body functions.

PYELITIS IN PREGNANCY

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ACUTE infections ,of the upper urinary tract have for many years been a serious complication of pregnancy. For want of a clear understanding regarding their etiology they were called "pyelitis of pregnancy."

Attention has been directed to the subject in the last two years by Hunner,[1] Kretschmer and Heaney,[2] J. O. Rush,[3] J. T. Williams,[4] and W. G. Sexton.[5]

During the past year and a half we have studied the cases of "pyelitis" during pregnancy which have occurred in the gynecologic-obstetric service at the Evanston Hospital. It was our custom to treat these cases by posture, free ingestion of water, and urinary antiseptics and, in case these methods failed to bring relief, by the ureteral catheter. In the great majority of cases these measures sufficed to bring temporary relief sufficiently to control the infection.

While nearly all the women were relieved sufficiently to make it possible for them to pass through pregnancy, it was frequently observed that patients who had a pyelitis during pregnancy were not entirely well after delivery.

Stimulated by the work of Hunner on stricture of the ureter as the predisposing cause of upper urinary tract infections, it occurred to us that the cause of the pyelitis occurring during pregnancy was already present before the pregnancy began, and that it was either a congenital or an acquired obstruction to the urinary outlet, instead of being due entirely to the pressure of the pregnant uterus, as is believed by some obstetricians and urologists at the present time.

With this idea in mind, we believe it is reasonable to assume that the obstructive pathology which existed during pregnancy, if due to obstruction rather than to the pregnant uterus, would be present after the uterus had been emptied.

It is not our purpose to take issue with anyone concerning the exciting organism or the route of infection, or whether the upper urinary tract during pregnancy undergoes a physiologic dilatation or not, but to report the pyelographic findings of cases of "pyelitis" occurring in pregnancy after the termination of the latter.

These investigations were carried out in the urologic department of the Evanston Hospital at periods varying from two weeks to four years after the termination of pregnancy, either by abortion or by delivery. They were made upon all women who had had "pyelitis" during pregnancy which was sufficiently severe to produce fever.

Pyeloureterograms were made in an effort to learn whether demonstrable changes in the urinary tract remained. The studies showed that in thirteen consecutive cases demonstrable distention of the kidney or ureter remained and obstruction of the ureter was present. Therefore, the assertion which has so often been made, that the termination of pregnancy cures the pyelitis, is not wholly true. In these thirteen cases abnormal changes remained in the urinary tract after the termination of pregnancy and could be demonstrated as hydronephrosis, hydroureter, and ureteral stricture.

1. Mrs. S.—Six months after delivery.
    Right: Hydronephrosis, hydroureter, ureteral kink, ureterocele, stricture at ostium.
    Left: Double kidney, fused double ureter, hydronephrosis, ureteral kink, double hydroureter, stricture at ostium.
2. Mrs. M.—One year after delivery.
    Right: Beginning hydronephrosis, dilated ureter, ureteral kink, stricture of ureter.
3. Mrs. DeM.—Four months after labor.
    Right: Early hydronephrosis, ureteral kink, dilated ureter, ureteral stricture.
4. Mrs. Ha.—*A.* Four months after delivery.
    Hydronephrosis, dilated ureter, ureteral stricture at ostium.
    B. One year after delivery.
    Showing effect of treatment.
5. Mrs. A.—Four months after abortion.
    Left: Early hydronephrosis, ureteral kink, dilated ureter, stricture of ureter at ostium. Diagnosis by bulb.
6. Mrs. V.—Six months after delivery.
    Left: Hydronephrosis, ureteral kink, dilated ureter, ureteral stricture at ostium. Diagnosis by bulb.
7. Mrs. B.—Eight months after labor.
    Hydronephrosis, dilated ureter, ureteral stricture at ostium.
8. Mrs. I. S.—Three weeks after labor.
    Right: Hydronephrosis, ureteral kink, dilated ureter, ureteral stricture.
9. Mrs. Ho.—Two and a half years after delivery.
    Right: Beginning hydronephrosis, dilated ureter, ureteral stricture.
10. Mrs. S.—Two weeks after abortion.
    Right: Dilated ureter, ureteral stricture.
11. Mrs. K.—Four years after pregnancy.
    Right: Hydronephrosis, ureteral kink, dilated ureter, ureteral stricture.
12. Mrs. F.—Three months after labor.
    Right: Hydronephrosis, dilated ureter, stricture at ostium. Diagnosis by bulb.
13. Mrs. Sch.—Three months after labor.
    Right: Hydronephrosis, dilated ureter, ureteral stricture.

MANAGEMENT

Considering the frequent occurrence of pyelitis in pregnancy, one cannot but be impressed with the fact that the pressure of the pregnant uterus does play a rôle in urinary drainage during pregnancy. How great its influence is can only be determined by more careful and systematic observation of the woman in the early weeks.

We believe too little attention is given to the examination of the urine in pregnant women. Systematic catheterization with urine cultures should be done as a routine on all patients with a history of vesical irritability, either recent or remote, at least twice in the early months of pregnancy.

Pain referable to the urinary organs, a history of chronic appendicitis, either alone or associated with vesical irritability are indications for urologic study at this time and can be accomplished with little danger to the mother or fetus.

As pyelitis is secondary in a large group of cases to foci of infection in the teeth, tonsils, and sinuses, these regions must be cleared of infection as the first step. Then, if adequate drainage was provided for in the urinary tract, it would be interesting to see whether or not "pyelitis" occurred in the later months of pregnancy.

In all acute cases of urinary obstruction occurring early or late in pregnancy our plan is as follows: The patient is put to bed, a mild laxative given, and free ingestion of water encouraged, a glass every hour while the patient is awake. The patient is prepared for cystoscopy. A suppository of extract of opium and extract of belladonna, ¼ grain each, is given one hour before examination, together with ⅓ grain of pantopon intramuscularly one-half hour before. As both opium and pantopon lessen pain and relax unstriped muscle we have found this procedure sufficient to make a cystoscopy practically painless, at the same time lessening the spasm of the ureter that is always present after morphine is given.

Having passed, if possible, a No. 6 F. whistle-tip ureteral catheter to the renal pelvis on each side in order to ascertain from which kidney pus is coming, pelvic lavage is next performed on the affected side, using normal saline solution. This should be continued until the returned water is macroscopically clear. This procedure will insure better drainage while the indwelling catheter is in place.

While in place the catheter must be watched carefully lest it become plugged. It is a safe procedure to irrigate gently the renal pelvis morning and night with normal saline solution.

As the pelvic mucosa and ureter are already swollen and congested the application of antiseptics, we believe, only adds insult to the injury that already exists. Nature will take its course if free drainage is provided for.

As a rule there is marked improvement in symptoms in four or five days and the catheter can be removed. At this time it is safe to dilate the ureter gently by passing a No. 7 F. bougie. If there is a return of symptoms the catheter may be again passed and left in situ until the symptoms subside.

We believe forcible dilatation of the ureter to No. 9 F. or No. 10 F. at the first cystoscopy is a mistake. It is true that it gives ample drainage, the one thing desired in urinary infection, but at the same time it forcibly tears the mucosa and thus paves the way, by producing scar tissue, for additional obstruction in the future.

Gentleness is of the greatest importance in dilating ureteral obstructions. It is our custom always to lubricate the ureteral catheter or bougie with liquid alboline before any attempt is made to introduce it.

A ureter that is dilated to No. 9 F. or No. 10 F. will usually give sufficient drainage to permit pregnancy to continue to full term, but this is not true in all cases.

We do not believe a pyelographic study should be attempted as a routine until after the pregnancy has terminated. We wish however, to emphasize the fact that treatment of these cases is necessary after pregnancy ends.

Inasmuch as our cases have all shown definite changes in the urinary tract which could be demonstrated after pregnancy terminated we feel that it is fair to suppose that, in some cases at least, this pathology must have been present before the pregnancy began. The acute attack of urinary infection during the pregnancy, then, would be due to aggravation of the original lesion by the pregnancy, and possibly to some additional obstruction produced by the pregnant uterus.

We are greatly indebted to Drs. R. A. Scott, Charles E. Galloway, and E. C. McGill for permission to report their cases.

CONCLUSIONS

1. In thirteen consecutive cases upon which pyelographic studies were made after the termination of pregnancy pathology in the urinary tract was demonstrated.

2. The termination of pregnancy does not cure the urinary infection. These cases should be treated after the pregnancy ends in order to restore adequate urinary drainage, if possible.

3. As pathology of the urinary tract was shown to exist after termination of pregnancy in all cases studied, it seems reasonable to assume that obstructive pathology may have been present before the pregnancy began.

REFERENCES

(1) *Hunner, Guy L.:* Am. Jour. Obst. and Gynec., 1925, ix, 47. (2) *Kretschmer, H. L., and Heaney, N. S.:* Jour. Am. Med. Assn., 1925, lxxxv, 406. (3) *Rush, J. O.:* Surg. Gynec. and Obst., 1925, xl, 428. (4) *Williams, J. T.:* Am. Jour. Obst. and Gynec., 1925, x, 765. (5) *Sexton, W. G.:* Wis. Med. Jour., 1927, xxvi, No. 4, p. 195.

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THE STUDY OF STILLBIRTHS OCCURRING IN 4000 CONSECUTIVE DELIVERIES*

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UNLESS we are willing to review our records and study the results obtained, we are really not in a position to judge accurately, or to value rightly any line of treatment, or any form of surgical procedure. If we admit, as I am sure we all do, that growth in medicine is dependent upon the correction of mistakes as well as upon the adoption of new methods of treatment, then statistic studies are as valuable and as well worth while as research and experimental studies, and aid equally in the solution of many problems.

On an obstetric service there are three outstanding groups of statistics that register efficiency and good treatment in a most impartial and accurate way; namely, maternal mortality, infant mortality, and stillbirths. At the Woman's Hospital we have just completed a study of both the maternal mortality and the stillbirths, and we are still at work on that of infant mortality. These studies are all based on 4000 consecutive ward deliveries, covering seven and one-half years (June 26, 1919, to January 1, 1927).

I shall offer in this paper the results and figures obtained in the study of stillbirths, and I desire to consider especially the group of cases which might be termed remediable, those in which there was born a normal viable baby, and in which the fetal heart was heard during labor or at the onset of labor. It is the study of this group, I feel, that will give the most helpful information.

In these 4000 deliveries, there are classified as stillbirths all those cases in which the baby never breathed, even though the heart continued to beat after birth, and in which the delivery occurred between the twenty-eighth week of pregnancy and term. On this basis there are 105 stillborn babies, or 26 per 1000, but since one mother had twins, both born dead, there are only 104 patients to be considered.

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*From the clinic of the Woman's Hospital.

In 55 of these patients no fetal heart was heard on admission to the hospital, in three there was doubt, while in 47 patients the heart was distinctly audible when the patient was admitted. Of these 47 there were 41 in which the heart was subsequently heard during labor, and 13 cases in which the heart continued to beat after the baby was delivered. Among the 105 stillborn babies 37 were premature and 68 at term; 44 were maccrated and 61 were not.

In view of the amount of work that is being done to educate patients to the importance of prenatal care, it is very interesting to see that 85 of these mothers had been attending the prenatal clinic and only 19 were emergency cases and not admitted from the clinic, giving a ratio of stillbirths among clinic patients of 21 in 1000 deliveries. Further analysis shows that of the 58 cases in which a fetal heart was not heard or was doubtful on admission, 45, or 77.5 per cent, were from the prenatal clinic, while among the 47 in which a fetal heart was heard on admission there were 41, or 87 per cent, from the prenatal clinic. This series, though small, is further substantiation of the importance of antepartum care, showing a higher percentage of clinic patients among those who entered the hospital with living babies. At the Woman's Hospital, all patients are expected to report every two weeks to the clinic, and oftener, if necessary, thus placing a real responsibility upon the men in charge of this department, in recognizing and treating abnormal conditions. Clinic patients are admitted to the hospital ward whenever any condition arises needing hospital observation and care; and the records show that the most frequent cause for this is toxemia. The rule in the past has been to admit all women showing evidence of this condition, but recently we have made this rule more elastic and are now admitting arbitrarily every woman who has a prenatal systolic blood pressure of 140. This may seem rather extreme, but we hope our results will justify the extra hospital days required. In this group which we are studying there were 25 patients with evidences of toxemia and 79 without, but only 18 cases came from the prenatal clinic. Four of the 25 patients with toxemia had convulsions.

Negative Wassermann reactions were found in 70 mothers; nine were four plus. One patient had extensive condylomata lata, syphilitic in type, and the remaining 24 had no Wassermann tests made. These omissions, I may say, occurred early in the series. Thus there were ten cases of syphilis found among the 80 examined, or one in eight. To these ten luetic mothers two babies were born with lues, one having a marked pemphigus and one a four plus cord Wassermann; the remaining eight showed no signs of syphilis. All placentas are sent routinely to the laboratory for examination. In addition 23 babies had cord Wassermanns done. Of the 105 stillbirths 53 were autopsied, and no other cases than those just mentioned gave any signs of syphilis.

A review of the autopsy findings on these 53 babies gives some interesting data, especially on intracranial injuries, of which there were 12. Three of these injuried babies were delivered by breech, five by breech following version, four by forceps, and one normally. In only one case was a fractured vertebra found; this occurred in conjunction with a torn tentorium and was not given as the cause of stillbirth. Table I is compiled from the reports of the pathologist.

Table I

Macerated Fetus		13
Cerebral Injury		12
Tear in Tentorium	7	
Tear in Falx Cerebi	1	
Tear in Falx Cerebi and Tentorium	1	
Cerebral Hemorrhage	3	
Intrauterine Asphyxia		7
Premature Fetus		4
Anencephalus		3
Hydrops Congenitalis		1
Fetus Papyraceus		1
Syphilis		1
Normal		11
		53

The cases of prematurity were not as frequent among these stillbirths as had been anticipated (Table II), there being only 37 babies born before term. These were very evenly distributed between the twenty-eighth and thirty-eighth weeks; 11 of them were in induced and 26 in spontaneous labors. In 14, toxemia was an associated condition; in 6, syphilis, and in 5, premature separation of the placenta.

Table II

28 to 38 weeks	6	34 to 36 weeks	7
30 to 32 weeks	7	36 to 38 weeks	10
32 to 34 weeks	7	38 to 40 weeks	68
			105

As one would expect, abnormal deliveries predominated, there being 61 (Table III), though it is surprising to find only 22 babies delivered with forceps. However, too much stress should not be laid on the method of delivery per se, when one considers that in more than half of the cases studied no fetal heart was heard on admission to the hospital.

TABLE III

Normal		44
Forceps		22
Low	5	
Medium	12	
High	5	
Breech		17
Breech after version		22
		105

Pelvic deformity was not an important factor in these cases, for ninety women had normal pelves (Table IV). Eleven were abnormal and three were not measured.

TABLE IV

Flat	6
Justo-minor flat	1
Masculine	4
Not measured	3
Normal	90
	104

Prolapsed cord occurred 11 times, in ten of which it was a contributing or actual cause of stillbirth.

Realizing that many figures confuse and are hard to assimilate, further study of these cases can be limited to the most important group, that in which a fetal heart was heard when the patient entered the hospital. If the baby was alive in 47 of these cases when the mother was admitted, and in 41 during part of her labor, why was there a stillbirth? This question is the one which should be carefully studied and all the important data tabulated in the hope that some definite and instructive conclusions may be reached. The six cases, in which a fetal heart was heard on admission, but not during labor (Table V), showed conditions which readily explain the stillbirths, and except for the two cases of prolapsed cord, could not have been altered. However, an earlier recognition in these two cases might possibly have helped in avoiding the stillbirths which resulted.

TABLE V

Eclampsia (emergency case, not from prenatal clinic. Labor induced).

Premature Labor (admitted with ruptured membranes at thirty-second week, but no pains. Autopsy: prematurity).

Abnormal Fetus (heart heard on admission, not afterwards. Autopsy: anencephalus).

Premature Separation of Placenta. (Labor induced. No fetal heart after insertion of bag. Hemorrhage 800 c.c.)

Prolapsed Cord—two cases (each admitted with history of ruptured membranes: in one, cord was prolapsed nine hours before onset of pains; in the other four and one-half hours. No pulsation in cords when found. One autopsy: normal baby).

The 41 cases in which a fetal heart was heard during labor show a variety of conditions, often several being associated in the same case. This has made it difficult to classify them concisely and at the same time to present tables that are accurate. However, there are certain outstanding points that can be briefly summarized, thereby enabling one to obtain quickly a general idea of this group of cases. Ten deliveries were spontaneous, 13 were with forceps, and 18 by breech, 14 of which followed version. This gives 75 per cent abnormal deliveries, with version and forceps about equal in frequency. Eight patients had a labor of over thirty-six hours and seven had ruptured membranes for more than twenty-four hours. There were ten persistent occipitoposterior positions, six being delivered by forceps after an instrumental rotation, and four by version and breech. Four presentations were breech, one was transverse, and one a face with chin posterior. Seven patients had deformed pelves, three being flat and four masculine in type. Three had a placenta previa, two a premature separation of the placenta, and five a toxemia. In seven babies the cord was around the neck, and in six the cord was prolapsed. Of the 18 babies autopsied, eight had a cerebral injury and ten were uninjured. It is interesting further to note that 31 of these stillbirths occurred in primiparae and ten in multiparae, or 75 per cent in patients having their first labor.

A more careful analysis of these 41 cases shows a group of 21 cases which may be called unavoidable. Either the complications were recognized early and all procedures that were possible instituted to meet them, or the stillbirths were beyond human control. Table VI shows these cases, listed according to the most important condition in each case.

TABLE VI

Prolapsed Cord	4
Prolapsed Arm and Cord	1
Placenta Previa	3
Persistent Occiput Posterior (Medium forceps,—instrumental rotation.)	3
Premature Separation of Placenta	2
Toxemia (induced labor)	2
Masculine Pelvis, medium forceps	1
Transverse Presentation (With prolapsed arm.)	1
Face Presentation, R.M.P.	1
Breech Presentation, dry labor	1
Cord around neck six times	1
Anencephalus	1
	21

There is a second group (Table VII) of eight cases in which the choice of a different type of delivery might have given the baby a better chance. Seven were in cases with a persistent occipitoposterior position, three of which were delivered by high forceps and four by version and breech. One was an elective version with the head unengaged. These eight are borderline cases in which the choice of delivery was difficult, since the patients were often entitled to a test of labor (seven being primiparae). Though they form a very small percentage of the 4000 deliveries reviewed, they illustrate a most important point, if we are to make every effort to reduce stillbirths to a minimum. Looking back upon them with our present view of these problems, one must feel that the three high forceps deliveries should not have been done, and the choice should have been between cesarean section and version; also that the patient with two previous stillbirths (Case 4) should have had a cesarean section and not a version. On the other hand the patient with marked toxemia (Case 7) was probably best handled by a version, since, in our experience at least, toxic patients do not stand laparotomies well. In the remaining cases one may question whether the choice of a version was the best solution. However, as these were all primiparae much may be said in its favor. Prolonged labors are bound to occur, and if we decide upon a thorough test of labor, they are at times unavoidable. However, should we not seek in every way to curtail these? Personally, I feel that on a hospital service where a majority of the patients have in the prenatal clinic the advantage of frequent and careful observations, during the latter weeks of pregnancy, this group of borderline cases should be so well studied in the clinic, that after admission a decision can be made within a reasonable number of hours and without subjecting these patients and their babies to the risks of prolonged labors. These cases emphasize the importance of the most careful prenatal study in all cases where potential difficulties during labor or delivery exist.

TABLE VII

1. Primipara, at term, normal pelvis. Prolonged test of labor, lack of advance, persistent O.P. High forceps; prolapsed cord, caught by forceps blades. Baby 9 lb. 4 oz.
2. Primipara, at term, flat pelvis. Prolonged labor, bag for dilatation of cervix, persistent O.P. High forceps. Baby 7 lb. Autopsy: Cerebral hemorrhage. Subsequent delivery by cesarean section, normal baby.
3. Primipara, at term, flat pelvis. Prolonged dry labor, bag for dilatation of cervix, persistent O.P. High forceps. Baby 7 lb. 13 oz. Subsequent delivery by cesarean section, normal baby.
4. Multipara, at term, normal pelvis. History of two stillbirths at home, last one of which was 13 years previously. Mild toxemia, persistent O.P. Version and breech. Baby 7 lb. Autopsy: Bilateral tear in tentorium.
5. Primipara, at term, flat pelvis. Dry labor, persistent O.P. Version and breech. Baby 8 lb. 3 oz. Subsequent delivery by cesarean section, normal baby.

6. Primipara, at term, normal pelvis. Prolonged dry labor, bag for dilatation of cervix, persistent O.P. Version and breech, cord tight around neck twice. Baby 7 lb. 12 oz.
7. Primipara, at term, normal pelvis. Marked toxemia. Labor induced with bag. Persistent O.P., too high for forceps. Version and breech. Baby 7 lb. 9 oz. Autopsy: Torn tentorium.
8. Primipara, at term, normal pelvis. Prolonged test of labor, L.O.A.; too high for forceps. Version and breech. Baby 9 lb. 4 oz. Autopsy: Torn tentorium and fracture of 6th cervical vertebra.

The third group (Table VIII) contains 12 cases, being those in which a more careful watching might have resulted in the recognition of fetal embarrassment in time for a successful operative interference.

TABLE VIII

TYPE OF DELIVERY	NO. OF CASES
Spontaneous Delivery	
Uncomplicated (following normal labor of less than 13 hours. One autopsied: Asphyxia)	4
With cord around neck (following normal labor of less than 20 hours. Two autopsied: Asphyxia)	3
Forceps Delivery	
Low Forceps (following normal labor. Two autopsied: Asphyxia)	2
Medium Forceps (following prolonged labor. One autopsied: Cerebral hemorrhage)	2
(Following prolonged dry labor. Masculine pelvis)	1
	12

The importance of following the fetal heart rate carefully during labor is apparent, and the need of promptly recognizing fetal embarrassment is essential, if each baby is to be given every possible chance. At the Woman's Hospital we are constantly laying emphasis on this point. At the beginning of this series, in 1919, the interns and resident physician made the observations on the fetal heart. Soon, however, the nurses in the delivery room were taught to count this, and directed to report any changes noted. Then we required them to record their findings on the labor record hourly in the first stage and half-hourly in the second stage. At the present time, in addition to the observations made by the interns and the resident physician, the nurses count the fetal heart every half hour from the onset of labor, and when the membranes rupture, second stage contractions begin, or complications arise, they do this every fifteen minutes. Frequent observations are continued in the delivery room, on abnormal cases, and, where there is slow advance, on normal cases, for the unborn child is entitled to every protection until safely in the world. The practice of obstetrics requires most careful watching of both mother and baby throughout labor and delivery if the best results are to be obtained.

SUMMARY

This study of the stillbirths in 4000 consecutive ward deliveries occurring on the Obstetrical Division of the Woman's Hospital shows:

1. There were 104 patients who had 105 stillborn babies, or 26 stillbirths per 1000 deliveries.

2. There were 85 of these patients who had been attending the prenatal clinic, giving 21 stillbirths, among clinic patients, per 1000 deliveries.

3. There were 25 patients who showed evidences of toxemia, and four of these had convulsions.

4. Nine patients among the 79 who had Wassermanns were four plus. One showed clinical evidences of syphilis. To these luetic mothers two babies were born with syphilis. No other babies gave any signs of syphilis.

5. There were 61 abnormal deliveries, 22 being by forceps and 39 by breech.

6. There were 90 patients who had normal pelvic measurements.

7. There were 37 premature babies and 44 were macerated.

8. There occurred 11 cases of prolapsed cord in ten of which it was a contributory or actual cause of stillbirth.

9. There were 53 babies autopsied and 12 of these showed cerebral injury.

10. In 55 patients no fetal heart was heard on admission, and in three it was doubtful. The heart in 47 was heard on admission and in 41 of these subsequently during part or all of the labor.

11. An analysis of these 41 cases suggests that some of these stillbirths might have been avoided:

    A. In eight cases if a different method of delivery had been chosen.

    B. In 12 cases if an earlier operative interference had occurred.

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Books Received

TEXTBOOK OF GYNECOLOGY. By James Young, physician, Royal Maternity Hospital, lecturer in clinical gynecology and obstetrics, etc., Edinburgh University. Containing 183 illustrations. Second edition. New York, The MacMillan Co., 1927.

DIE GYNAEKOLOGIE BEI DIOSKURIDES UND PLINIUS. Von I. Fischer. Wien. Verlag von Julius Springer, 1927.

THE NEW MEDICAL FOLLIES. By Morris Fishbein, M.D. New York, Boni and Liveright, 1927.

ADMINISTRATION OF AMERICAN EXPEDITIONARY FORCES. Prepared under direction of Maj. Gen. M. W. Ireland by Col. Joseph H. Ford. United States Government Printing Press, 1927.

DIE GONORRHOE DES WEIBES. Von Dr. R. Franz, Privat Dozent, Maria Theresia Frauenhospital in Wien. Verlag von Julius Springer, 1927.

THE OPERATIONS OF SURGERY. By R. P. Rowlands, surgeon to Guy's Hospital, and Philip Turner, surgeon to Guy's Hospital, etc. Seventh edition, thoroughly revised and largely rewritten. With 900 illustrations (43 in color). Vol. II, Part VI. The Abdomen. New York, The Macmillan Co., 1927.

FORTSCHRITTE DER STERILITAETSBEHANDLUNG. Von Hugo Sellheim, Professor und Direktor der Universitaets-Frauenklinik in Leipzig. Mit 21 Abbildungen im Text. Berlin, Verlag von S. Karger, 1927.

HANDBUCH DER INNEREN SEKRETION. Herausgegeben von Dr. Max Hirsch, Berlin. I Band, Lief. 3; III Band, Lief. 2 & 3. Leipzig, Verlag von Curt Kabitzsch, 1927.

BIOLOGIE UND PATHOLOGIE DES WEIBES. Herausgegeben von Josef Halban und Ludwig Seitz. Lieferungen 36 & 37. Verlag von Urban und Schwarzenberg, 1927.

LEHRBUCH DER TOPOGRAPHISCHEN ANATOMIE. Von John Blumberg, Dozent und Vorstand des Chirurgisch-Anatomischen Institutes, Universitaet Dorpat. Mit 152 groesstenteils faerbigen Abbildungen im Text. Urban und Schwarzenberg, Wien, 1926.

METHODS AND PROBLEMS OF MEDICAL EDUCATION. The Rockefeller Foundation, New York. Fifth, Sixth and Seventh Series.

BIOLOGIE UND PATHOLOGIE DES WEIBES. Herausgegeben von Josef Halban und Ludwig Seitz. Lieferungen 34 und 35. Urban und Schwarzenberg, Wien, 1927.

INTERNATIONAL CLINICS. Volume II. Thirty-seventh Series. J. B. Lippincott Company, Philadelphia, 1927.

DIE MANUELLE PLAZENTALOESUNG. Von Dr. H. Heidler und Dr. B. Steinhardt. Wuerzburger Abhandlungen, Bd. IV, Heft 8. Verlag von Curt Kabitzsch. Leipzig, 1927.

PRÉCIS D'OBSTÉTRIQUE. Par Ch. Maygrier et A. Schwaab. Troisième édition, revue, corrigée et augmentée. Avec 336 figures dan le texte. Libraire Octave Doin, Paris, 1927.

HOW TO MAKE THE PERIODIC HEALTH EXAMINATION. By Eugene Lyman Fisk and J. Ramser Crawford, M.D. The MacMillan Co., New York, 1927.

THE MEDICAL DEPARTMENT OF THE U. S. ARMY IN THE WORLD WAR. Volume XI. Surgery, Part One. Government Printing Office, Washington, 1927.

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Original Communications

RHYTHMIC CONTRACTIONS AND PERISTALTIC MOVEMENT IN THE INTACT HUMAN FALLOPIAN TUBE AS DETERMINED BY PERUTERINE GAS INSUFFLATION AND THE KYMOGRAPH*

(An Experimental and Clinical Study)

By I. C. Rubin, M.D., F.A.C.S., New York City

THAT the fallopian tubes which are histologically not unlike the intestinal tube are capable of muscular contractions has long been assumed but never until very recently has this physiologic phenomenon been actually demonstrated. The reasons for this failure are due (1) to the circumstance that the motions of the tube are slow under physiologic conditions and under diseased conditions they are inhibited or paralyzed; (2) narcosis undoubtedly affects the tubal motions; the latter are so profoundly retarded and weakened by it as to be completely obscured.

Contractions of isolated strips of the excised tube have been demonstrated repeatedly on the kymograph since Kehrer's[1] classic experiments. It was, however through the physiologic experiments of George W. Corner[2] and his associates that renewed interest in the function of the tubes was aroused. They showed that there is a definite relationship between the rythmic tubal contractions and the menstrual cycle, both of which depend upon ovarian function. Wislocki and Guttmacher[3] independently of F. Kok[4] were able to produce tubal contractions by immersing the intact uterus and tubes of pigs in oxygenated Locke's solution. Kok[5] then demonstrated the same phenomenon in human tubes, but he found it necessary first to strip them of their peritoneal and ligamentous coverings.

Actual visible peristalsis can be produced in another way. By insufflating with oxygen the pig's uterus which has been immersed in Locke's solution, the tubes may be seen to exhibit rhythmic contrac-

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*Read at the Fifty-second Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 23-25, 1927.

Note: I am indebted to my chief, Dr. Robert T. Frank, and to Drs. George Streeter and G. A. Hartmann of the Carnegie Institute of Embryology, Baltimore, for a critique of my kymographic tracings and also for suggestions as to the proof of tubal peristalsis being recorded by uterotubal insufflation.

Note: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

tions. The tubouterine junction is most convenient for this experiment and about three inches of uterus with the tube attached is used. This for practical purposes is analogous to the human uterus and tubes. The cannula is inserted into the uterus and tied around the notch of the rubber acorn. The method of insufflation is precisely the same as used in the clinical test. The manometer registers a certain initial rise of pressure which drops as soon as the valve-like resistance offered by the tubouterine ostium has been overcome. With an attached kymograph the motions of the tube are then recorded. (Fig. 1.)

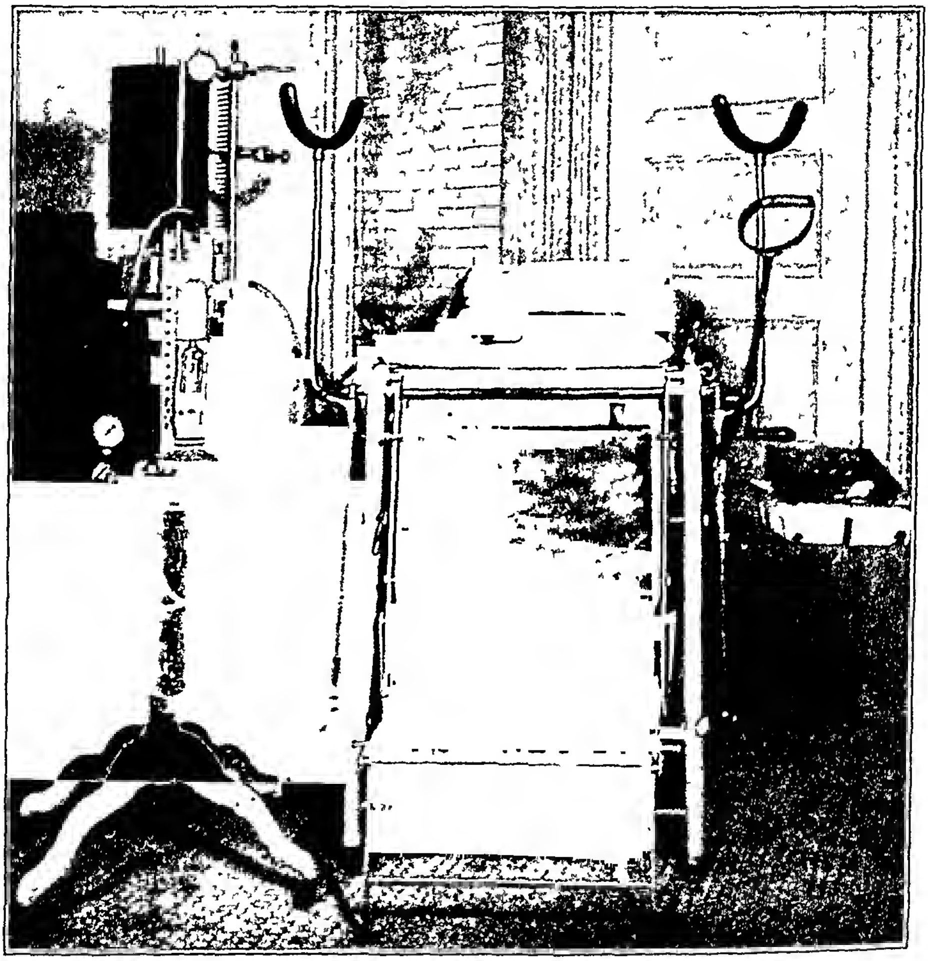

Fig. 1.—Kymograph with siphon-volumeter, carbon dioxide tank, reduction valve, rubber tubing attached with cannula resting on the table. Carbonized paper used.

The recurrent contractions cause a simultaneous rise of the mercury in the manometer and an upward stroke on the smoked drum. The release of the gas through the tubes is coincident with the muscular relaxation and is recorded by a descending stroke on the drum. The ascent and descent are steep or more sloping. The drop in pressure is characterized by sharp angles or gentle curves. (Fig. 2.) There is a certain regularity in time of occurrence and appearance of the contractions. Secondary contractions on the upward or downward slope of the curves are also recorded. These small contractions are not always discoverable with the naked eye but the larger contractions are plainly visible and are synchronous with the recording instrument. The same results may be obtained when CO_2 gas is used, but in this case the specimen must be kept in oxygenated Locke's solution.

Although noticed in the early part of my work with tubal insufflation in 1919 and 1920,[6] the interpretation of the fluctuations in the mercury column was nevertheless unsettled until two years ago. In May, 1925, I began the study of human tubal peristalsis by recording on the revolving drum the variations in pressure coincident with the passage of the gas through the uterus and tubes. Guthmann[7] was the first to my knowledge to express the opinion that the manometric fluctuations were due to tubal peristalsis. His reasons were based on the well-known observation that when the tubes are closed, fluctuations in the manometer are not observed. This fact to his mind excluded the uterus as a factor in the production of the pressure fluctuations. No experimental work was done to support this simple explanation. It appeared, however, that other physical or mechanical factors inherent in the tubes or extraneous to them might be responsible for the manometric fluctuations.

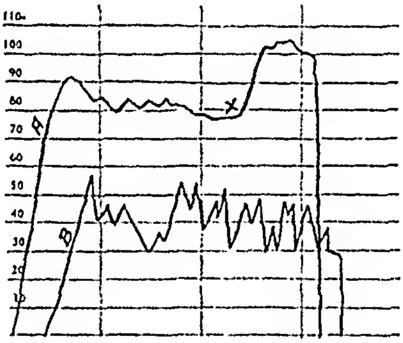

Fig. 2.—Kymographic tracing made during peruterine tubal insufflation in two cases. Note the difference in the initial pressure rise and the character of the curves in *A* and *B*. (*A*) Showing the gentle curve described at the initial drop in pressure. (*X*) Marks point where patient made a voluntary effort at straining. Up to this point patient breathed naturally, abdominal muscles relaxed. There were no deep pressure fluctuations. (*B*) Kymographic tracing showing sharp initial pressure drop 56 mm. Hg. to 41 mm. Hg., and then typical fluctuations of normally patent tubes.

Further proof was essential, therefore, to demonstrate that tubal peristalsis is in reality responsible for the rhythmic variations in pressure noticed during uterotubal insufflation. The following steps were necessary for this proof:

1. To perform uterotubal insufflation on the extirpated uterus and tubes.
2. To observe the effect of insufflation on surviving specimens of the human genital organs and those of lower animals with and without ligation of the tubes.
3. Reversed insufflation with special reference to the intramural portion of the tubes.
4. Exclusion of uterine cause of contractions by experiment on the excised organs.

5. The factor of tubal elasticity and of superimposed weight.
6. To observe many clinical cases in which tubal insufflation was carried out with aid of the kymograph, and a control series in which lipiodol was injected into the uterus.
7. To exclude other factors, such as respiration, cardiovascular and extraneous intraabdominal pressure including intestinal contact.
8. The effect of varying the rate of flow of the gas.
9. Effect of direct intraperitoneal injection of the gas.
10. To note the changes in the phenomenon by doing preoperative tubal insufflation followed in the same individual by insufflation during laparotomy; and in case of an hysterectomy upon the extirpated specimen.
11. Evidence derived from abdominal auscultation.
12. Radiologic evidence of tubal peristalsis.

Insufflation of the Extirpated Uterus and Tubes.—It was found that when gas was allowed to pass through the excised uterus and tubes the pressure would rise to normal limits when the tubes were patent and then drop to a certain level, where it would be maintained for as long a time as gas was passing through the tubes. (Fig. 3.) *There was no tendency in the dead specimen for the passage of the gas to cause pressure changes.* The gas was seen to escape in bubbles of practically even size and rate. In the freshly extirpated human organs there was a slight tendency for pressure changes (Fig. 4) to be described on the drum for a short time.

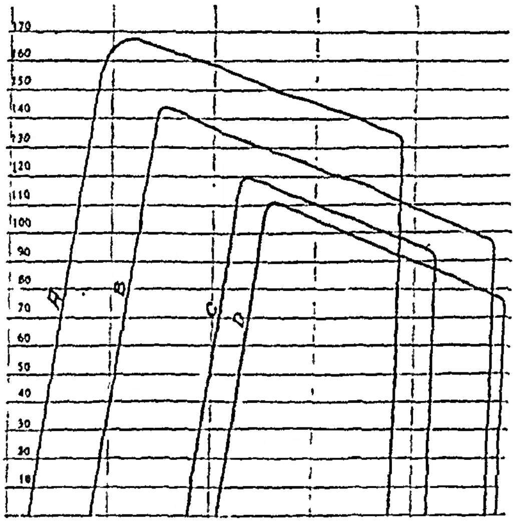

Fig. 3.—Shows the character of the kymographic tracing made during peruterine tubal insufflation of nonsurviving specimen of uterus and tubes. The initial pressure rise before gas escapes through the tubes is lower with each successive insufflation as seen in *A, B, C,* and *D.* No fluctuations in pressure are noted as the gas passes through the tubes. (cf with Fig. 2.)

Effect of Insufflating Surviving Specimens of Human Genital Organs.—In favorable cases where the uterus and tubes had been kept in Locke's solution and the gas was passed through them immediately or only a few minutes after their removal, tubal contractions were also seen with the naked eye. These contractions were, however, best seen when the specimen was kept in warm Locke's solution (temperature 98.6° to 102° F.) during the time gas was allowed to pass through it. They were simultaneous with the upward rise of mercury pressure and the upward stroke of the curves as recorded on the drum. During relaxation the pressure dropped. It was also seen that the gas would either stop escaping from the fimbria during the period of tubal contraction or appear only in the gentlest stream of small bubbles. The moment the contraction ceased the gas at once escaped in large, rapidly succeeding bubbles making the characteristic gurgling, bubbling sound heard when one auscultates at the anterior abdominal wall during peruterine tubal insufflation. It will be remembered that the pressure-rate-flow is constant in these experiments and the flow of gas is regulated by a reduction valve.

When human fallopian tubes are ligated or clamped off at any point from the uterine insertion to the fimbria, there result no fluctuations. In the latter instance the tubes become distended and though the pressure may reach 200 mm. Hg. there is no reaction on their part; they remain paralyzed for the time being by the distending gas. If the pressure is released step by step, 10 mm. Hg. at a time, by means of a release valve (the tubes being kept closed) down to the lowest pressure levels, no fluctuations are produced. Nor do they appear when the gas is allowed to regurgitate through the cervix at one and the same or at different levels of pressure. When, however, the tubes are freed of the clamps or of the ligatures and physiologic conditions are restored they again appear simultaneously with visible peristalsis. The latter may be somewhat altered at first owing to the momentary injury, but they rapidly regain their "normal" or pre-

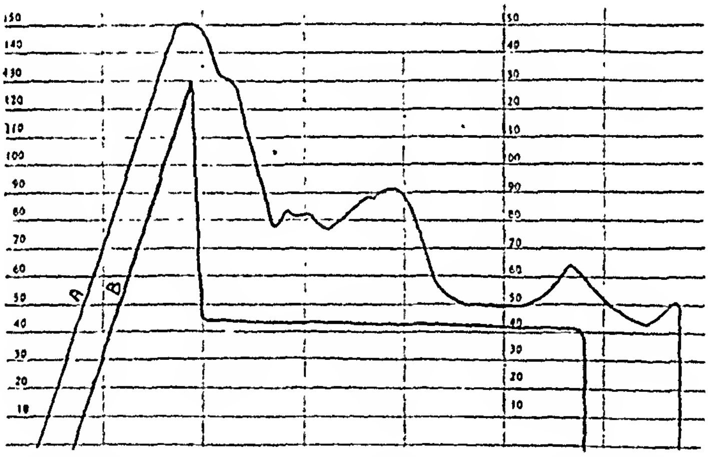

Fig. 4.—(A) Shows an occasional contraction of the tubes in a specimen insufflated immediately after removal from the body. The initial pressure rise being 151 mm. Hg. (B) The same specimen when grasped with bullet forceps. Leakage through bullet hole in uterus. The gas escaped through the bullet hole at 128 mm. Hg. and none passed through the tubes. Not the slightest tendency at contraction waves was noted showing that the uterus itself does not exhibit contractions during uterotubal insufflation.

vious, undisturbed character. These experiments would appear to indicate that for the demonstration of peristalsis by peruterine insufflation the tubes must be patent. In repeating this experiment on the pig's oviducts the findings were practically the same with one exception. Feeble peristalsis was seen when the pressure of the gas was reduced to 50 or 60 mm. Hg., an avenue of escape for the gas being provided by slightly opening up the needle-valve.

The Question of a Uterotubal Valve Action.—The tubes shut down upon the gas in a gradually and progressively segmental manner. Whether the fluctuations in pressure are also influenced by a possible successive opening and shutting of a valve such as Lee has described at the tubouterine junction was not quite clear. It remained, therefore, to conduct the experiments in the reverse way; that is, to insufflate through the fimbriated end of the tubes and towards the uterus. Peristalsis was produced by this procedure and had the same character as when produced by uterine perflation.

In the case of human tubes, contractions sometimes ceased completely when the intramural portion of the tubes was cut away. In the case of pig's, contractions continued even when only a short piece of the isthmic portion of the tubes was left intact and ceased altogether when the tube was removed on the distal side of the isthmicoampullary junction. In another series of experiments the tubes were excised just external to the intramural portion, and the uterus was insufflated. Under these circumstances fluctuations were observed. When the intramural portion was cut away, however, the initial pressure was slight, the gas escaping through the uterine horn under very low pressure and without exhibiting any variation in pressure that might suggest rhythmic contractions. The same results were found in experiments upon the excised uterus and tubes of the pig. A certain degree of tonus appears therefore to be maintained at the tubouterine junction which must first be overcome before the gas can pass from the uterine cavity to the tubes, and further that it acts like a valve opening and closing in rhythmic fashion. There is other evidence, chiefly radiologic, pointing to the existence of a sphincter-like apparatus at the tubouterine junction corroborating Lee's findings in animals. The tonus appears to vary in different individuals and at different menstrual phases in the same individual.

The contractions are seen to begin in practically all cases at the fimbria and to extend toward the uterus. Irregular contractions and antiperistalsis have been observed and confirm the observations of Wislocki and Guttmacher.

Exclusion of a Uterine Cause of Contractions.—Exclusion of the uterine cause of the manometric fluctuations is a simple thing to accomplish in the extirpated genitalia by ligation or temporary clamping of the tubes. The uterus appears motionless in all experiments. It is seen to distend and become tense and when the pressure is relieved, expels the gas through the cervix by an elastic rebound.

Clinically a genuine uterine contraction may however also occur and may account for the escape of the gas. I have the impression that in some instances the uterus exhibits a tendency to contract before a pressure is obtained which is sufficient to force the gas through the uterine ostium of the tubes. Frequently in cases of tubal patency there is a slight regurgitation from the cervix simultaneously with the initial drop of pressure. It is possible that when the tubouterine opening is "forced" a certain degree of uterine contraction is provoked.

To exclude the uterus as a possible cause of the rhythmic contractions noticed in clinical uterotubal insufflation the test was first carried out on the patient in the usual way. The initial pressure rise and the initial drop of pressure were carefully noted. Having in this way established the degree of patency of the tubes the uterine cannula was removed from the uterus and a rubber balloon was fitted over it. The balloon was then inflated to see whether it could sustain a pressure of 200 mm. Hg. without rupturing. For our purpose Penrose tubing was used as it is thin and can be rolled around the cannula so that it may be easily introduced through the cervical canal into the uterine cavity. The same gas rate flow was used to inflate the balloon as was previously employed in the test. (Fig. 5.) The balloon was then inflated till the same pressure was reached which had been found to be adequate for overcoming the resistance of the uterine ostia of the tubes. The pressure was then raised in order to note any change in the manometer, and it was also lowered. This was repeated in an ascending and descending scale from maximum pressure tolerance to the point where the rubber balloon was collapsed. Under these conditions, once the pressure reached the desired point it was maintained by closing the gas valve, and though the drum was allowed to revolve, the writing point described a horizontal line or a very gentle slope (if the slightest leak was present) but no fluctua-

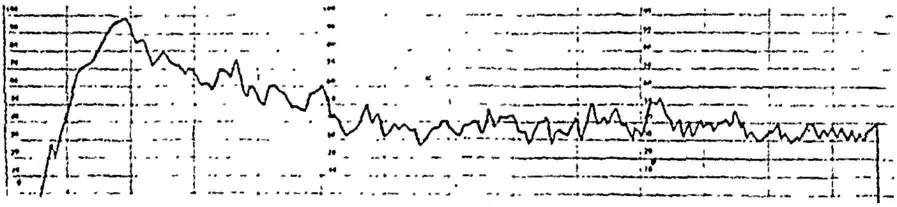

Fig. 5.—Specimen immersed in warm Locke's solution, temperature 102 degrees F. Oxygen insufflation through the uterus and tubes, initial pressure rise to 100 mm. Hg., whereupon gas was seen to escape from both tubes describing curves on the kymograph. These are practically of the same character as noted in the clinical tubouterine insufflation. (cf. with Fig. 2.)

tions were seen. (Fig. 6.) The balloon was withdrawn each time at the point of pressure maintained during the inflation in order to be sure of its intactness and its distention. The experiment is practically the same as the procedure described by Rucker in testing the effect of pituitary injections on the parturient uterus.

These experiments proved that unlike the tubes the nonpregnant uterus did not exhibit rhythmic contractions under the same circumstances, i.e., peruterine tubal insufflation.

The Possible Factor of Tubal Elasticity as a Cause of Manometric Fluctuations.—Were it not for the fact that actual rhythmic contractions may be seen in the surviving organs during the time the gas passes through the open tubes, the factor of elasticity might theoretically, at least, be assumed to be a cause of the manometric fluctuations. That a definite contraction relaxation mechanism is necessary to produce the rhythmic changes on the kymograph, a property inherent in living muscle has already been shown by the complete absence of such fluctuations when dead tubes are insufflated. The experiment, however, has been further reproduced by using rubber tubing. It was seen that when the latter was freely open the gas passed through in an even plane. When different weights were placed upon them the gas rose to a certain pressure adequate to overcome the resistance of the superimposed weight and then dropped in an even line without exhibiting the slightest trace of curves. This also excludes the possibility of the weight of the intestines causing changes in the intratubal pressure. In experiments with the pig's uterus and tubes an analogous condition was reproduced as is found in the abdomen. The uterus coils up tremendously when inflated and if the tubes be placed under these coils during the insufflation they exhibit

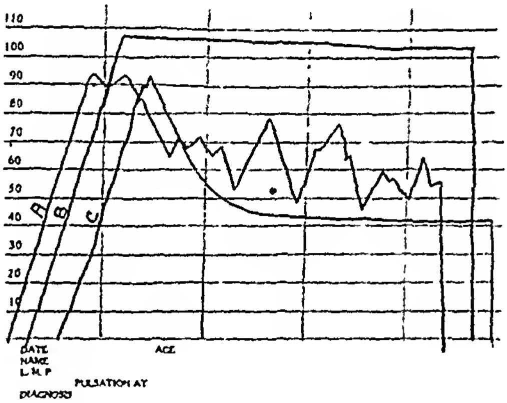

Fig. 6.—Curve *A* shows a practically normal tracing of peruterine tubal insufflation in a case of patent tubes. (*B*) A rubber balloon having been fastened over the cannula and introduced into the uterus of the same patient immediately after tracing (*A*) was made, shows an absolute lack of contraction waves. (*C*) The release valve being gently opened with the gas flowing continuously, shows a complete absence of contraction waves.

the same type peristalsis and the same pressure fluctuations as when they are entirely freed from the weight of the uterine coils.

Observations on Clinical Tubal Insufflation.—Observations in some 650 cases where peruterine insufflation was carried out in conjunction with a recording drum have thrown added light and have confirmed the evidence adduced from the experiments. The findings are in general of two types: (1) Fluctuations of the manometer are present and these are recorded on the revolving kymograph. (2) Fluctuations are absent. The first is practically or always associated with other evidence of tubal patency, such as subphrenic pneumoperitoneum, auscultatory signs and phrenic shoulder pains. The second is found in cases where all the other evidence points to closed tubes or at least to a high grade stricture. In order to check up this factor and without subjecting the patient to a laparotomy I injected lipiodol into the uterus of fifty patients who had previously been examined for tubal patency by the method of uterotubal persufflation and had been found to have nonpatent tubes or an organic stricture. The fallopian tubes of this group of patients were either obliterated at the uterine end or sealed at the fimbria. In either case the manometer failed to register fluctuations. The radiographic evidence obtained confirmed the findings of the gas insufflation, that is, an obstruction in the tubes.

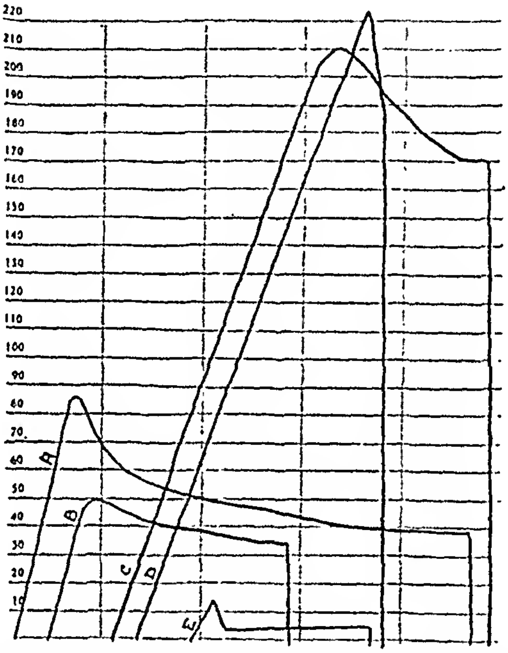

Fig. 7.—Shows tracings of insufflation of fallopian tubes removed several hours before and assumed to be dead. To note effect of external constriction weights are placed upon the tube (*A*) Shows the effect of placing a 1.4 lb. weight over the tube, the initial pressure rise being 85, gentle drop as the gas passes through the tube. (*B*) Second attempt at insufflation with the same weight, initial pressure rise 49 mm. Hg. (*C*) 2.2 lbs. weight placed on tube, initial pressure rise 207 mm. Hg., gentle drop of pressure as gas passes through tubes. (*D*) The same weight placed near the uterinetubal junction, initial pressure rise 220 mm. Hg., when the weight was removed as the gas passed through. (*E*) Shows a tracing of insufflating a dead tube without a superimposed weight.

This presence or absence of mercury fluctuations during peruterine insufflation may therefore be taken as additional evidence in favor of or against the fact of tubal patency.

Other Extraneous Factors Which Influence Manometric Fluctuations.—When the gas enters the peritoneal cavity through the tubes, changes in intraabdominal pressure can also be recorded. When the tubes are closed, such intraabdominal pressure changes cannot be recorded. There are circumstances when, for reasons which will be taken up later, the fluctuations are slight or irregular and it is somewhat doubtful whether the tubes are open. If when in such case the patient is asked to bear down voluntarily there is a simultaneous rise in pressure it is evidence that the gas has succeeded in entering the peritoneal cavity. (Fig. 7.) Coughing, sneezing, or very deep breathing may produce similar pressure rises when the tubes are freely patent or only partially occluded.

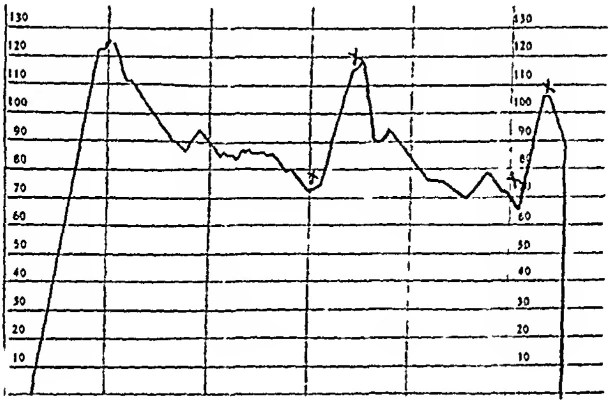

Fig. 8.—Shows a tracing in the case of tubal stricture without complete occlusion. Initial pressure rise 125 mm. Hg. with very faint irregular contraction waves. At (*X-X*) patient was requested to bear down with the resulting rise of pressure 40-45 mm. Hg. in depth.

When the gas passes through stenosed or partially strictured tubes the initial pressure being 160 to 200 mm. Hg. and a slight or sharp drop is noted, there will be no fluctuations. But voluntary straining produces slight pressure rises as the gas passes through into the peritoneal cavity. (Fig. 8.) An exception to this rule is offered by the case of closed tubes and a large atonic uterus which is so distended by the gas as to allow the abdominal wall to press upon it and so cause a rise in the mercury column. This is readily demonstrated by filling the urinary bladder with gas and making manual pressure over it or asking the patient to strain.

When the initial rise of pressure is within normal limits and no fluctuations are observed but as the patient bears down there is at once a distinct increase in pressure as registered on the drum, it is presumptive evidence that the tubes are patent but probably not functioning normally. The same holds true in the presence of cervical regurgitation. The latter is sometimes confusing in the performance of the insufflation test. When voluntary bearing down efforts or coughing produce pressure changes in spite of the regurgitation and they are also recorded on the kymograph, they may be taken to indicate that the tubes are patent.

A different picture is presented in the presence of spasm of the tubouterine junction. In this case the initial pressure rises to well above 100 mm. Hg. usually to from 140 to 180 or even 200 mm. Hg. The pressure falls to 140 or less in a gradual descent or sharply to a lower level when fluctuations more or less typical are exhibited. This may not be repeated on a subsequent insufflation. The strictured tubes, however require practically the same relatively high initial pressure before the gas passes through them in any test, and because of their rigidity due to adhesions or muscular infiltration they do not permit of rhythmic contractions. Studies in the effect of certain pharmacologic substances on spasm and peristalsis in general have not yet been undertaken but await systematic trial.

Respiration does not appreciably influence the manometer during uterotubal insufflation. The curves produced by tubal contractions upon the inflowing gas are out of all proportion to the respiratory rate; being three, four, or at the most, nine to the minute, as against sixteen to eighteen or more respirations per minute. Control observations of the breathing and the manometer show them to be entirely independent of each other, normal respiration scarcely entering into the process. By asking the patient to breathe rapidly or more slowly and deeply it has been noted that the manometric fluctuations are unaffected. Nor does conversation on the part of the patient during the kymographic tracing influence the character of the curves.

Effect of Varying the Rate of Flow of the Gas.—The question as to what extent the rate of flow of the gas affects the character and frequency of the manometric fluctuations was settled by varying the rate of flow in the same case. After establishing the "normal," i.e., with the usual pressure-rate-flow, the gas was allowed to flow in faster for a short while; then more slowly. Within certain limits, that is those set down for the safe performance of peruterine tubal insufflation, the character of the fluctuations is unaffected as far as the rate is concerned, but they cover a much wider pressure range, maintaining a higher pressure level when the rate of flow is accelerated. A very slow stream of gas does not register the typical curves because not sufficient pressure is maintained within the uterus and tubes for this apparatus, at least, to record them. The more rapid rate influences the curves very little because the minimum pressure is maintained.

Effect of Direct Intraperitoneal Injection of the Gas.—In order still further to exclude the influence of respiration upon peruterine insufflation and some possible reaction of the peritoneum to the instreaming gas bubbles,* the gas was introduced into the peritoneal cavity by direct abdominal puncture under the same rate-flow as employed in peruterine insufflation. It was then seen that rapid, close pressure rises aggregating 20 or more per minute with a shallow amplitude were described. (Fig. 9.) As the volume of gas within the abdomen increased the fluctuations became closer, approximating 56 to 76 per minute. The respirations in this particular case, a debilitated woman who had had ascites, were noticeably increased and were synchronous with those closely recorded up and down strokes. It also appeared as if the heartbeat transmitted an impulse to this artificially produced air bag within the peritoneal cavity. Two thousand cubic centimeters of carbon dioxide were thus introduced into the abdomen. By comparing this curve with the several hundred obtained by the method of peruterine insufflation it was seen how absolutely it differed from any and all of them. In one other case where this procedure was repeated practically the same results were obtained.†

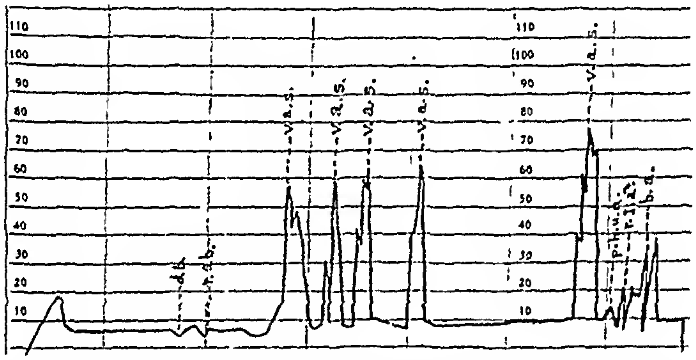

Fig. 9.—Cystogram (300 c.c. of carbon dioxide introduced into the bladder at the same rate of flow as employed in peruterine tubal insufflation in a patient with an artificial vagina). (*d.b.*) Shows effect of deep breathing; (*r.s.b.*) shows effect of rapid shallow breathing; (*v.a.s.*) shows effect of voluntary abdominal straining causing marked rises in pressure, but there were no fluctuation waves as recorded in the normal peruterine insufflation; (*p.h.u.a.*) shows effect of pressure with hand over upper abdomen; (*r.l.a.*) pressure with hand over right lower abdomen; (*b.a.*) pressure with hand over bladder area.

Preoperative, Cooperative and Postoperative Insufflation.—It was further desirable to note the behavior of the mercury column in the same case (1) by preoperative uterine insufflation, (2) insufflation during laparotomy, and (3) in the event of the uterus being removed, upon the extirpated specimen itself. The object of this was to see whether the character of the contraction waves differed materially when the abdomen was opened and also to note the change wrought by the anesthesia. Accordingly in two cases it was possible to do a peruterine insufflation before laparotomy and before the narcosis was administered; then to repeat it without removing the uterine cannula under identical conditions when the patient was deeply anesthetized and the abdomen open. Inspection of the tubes failed to elicit any motion. The curves described were shallow and slower, if they appeared at all, than in the normal state. The specimen itself exhibited the same type curves when removed from the body as it produced before the patient was anesthetized. These findings showed that the contraction waves seen on the kymograph during the clinical application of tubal insufflation are due to a mechanism residing within the genitalia themselves and further that tubal peristalsis is responsible for them. (In performing this experiment one has to be careful in handling uterus and tubes as manipulation naturally will produce pressure changes.)

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*This possibility was suggested by Dr. Carl Hartmann.

†Cases from the Montefiore Hospital where a pneumoperitoneum was desired for diagnosis.

Evidence Derived from Abdominal Auscultation.—In carefully studying the sounds produced within the abdomen by the passage of the gas through the tubes, it was found that there were definite silent intervals between a succession of sounds. In the specimen itself the bubbles of gas were seen to escape in two types of streams; one, a rapid stream of rather large bubbles making a loud noise; and the other, a stream of slowly escaping small bubbles making a much lower-pitched sound. Frequently a silent interval followed the high-pitched sound. The same findings were obtained in abdominal auscultation during the insufflation. These sounds were synchronous with the curves on the drum. It was possible practically every time to tell from the character of the sounds whether the curve was upward or downward, an assistant watching the kymograph while one listens with the stethoscope over the anterior abdominal wall. This finding may also be taken as an indication of tubal contractions and therefore of tubal patency. If one listens over the abdomen when the tubes are closed he will fail to hear these sounds, a fact already brought out by Henderson and Amos in 1921.[8]

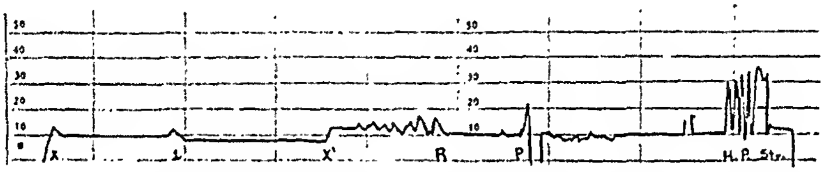

Fig. 10.—Showing tracing of direct intraperitoneal insufflation of abdominal puncture. Very shallow irregular curves with distinct rises when pressure is made over abdomen with the hand, or the patient strains deeply as noted at (*H.P.Str.*). *X* marks the point where eight pulsations of a siphon-meter were recorded, primary rate flow 30 seconds per pulsation increased at (*1*) to 25 seconds and at *X'* to 5 seconds. *X'*—*R* marks normal breathing. At *P* the trochar was pressed into the peritoneal cavity as it was thought that the gas was leaking.

Radiologic Evidence of Tubal Peristalsis.—To these findings, radiologic studies have brought the last and most striking proof of the clinical occurrence of tubal peristalsis. Dyroff[9] thought he had demonstrated the fact of tubal contractions in one case by the appearance in the x-ray film of "pearl-like" shadows produced within the tubes injected with lipiodol. A. J. Bendick and I[10] have been fortunate in demonstrating tubal peristalsis by intrauterine lipiodol injection and studying the uterus and tubes with the aid of the fluoroscope. We found contractions of the tubes in 18 cases out of 30 studied. The tubes in some of our cases had previously been removed surgically and in the remainder of the series they were either stenosed or nonpatent. These facts were first established by peruterine tubal gas insufflation as it was desirable to avoid injecting an excess of lipiodol, or any at all, into the peritoneal cavity itself. We hazarded this only in a small number of our cases where a tight stricture was diagnosed by the gas test and only the slightest amount, one or two c.c. at most, of the lipiodol might find its way into the abdomen.

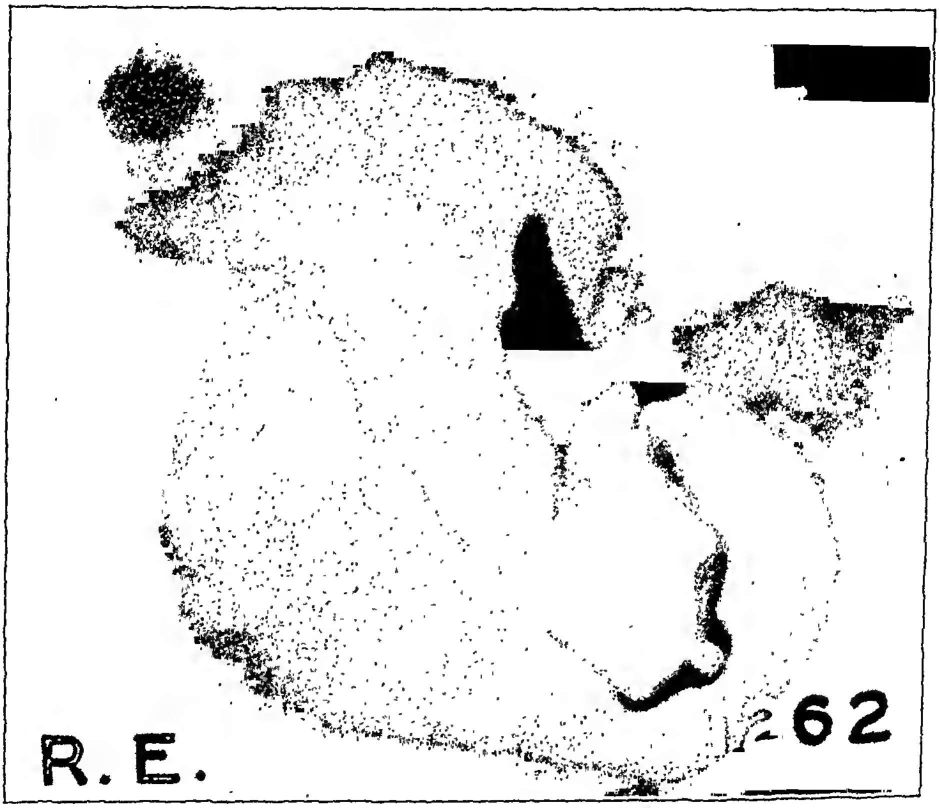

Fig. 11.—Shows tubal peristalsis of the left tube, lipiodol having been injected through the uterus. The fimbriated end of the tube is beautifully shown. Note also the increased length of the tube.

A point of difference between using gas and using lipiodol or any other radiopaque substance in the diagnosis of tubal peristalsis is the fact that when the tubes are distended with the gas they become paralyzed for the time being. For the fluoroscopic visualization of tubal peristalsis with lipiodol, *however*, the tube lumen does not have to be distended with the fluid, a small amount sufficing so that the tube muscle retains its peristaltic action. The movement of the fluid can be readily observed under the fluoroscope. (Fig. 11.)

It may be interesting to note that the uterus filled with lipiodol partly or to the point of distention does not change its shape as far as we can make out. In lower animals, however, well marked uterine contractions have been seen when the uterus is filled partially or completely with lipiodol. Further observations on this particular point are under way at the Roentgen Department of Mt. Sinai Hospital in collaboration with Drs. Kross and Snow.

SUMMARY AND CONCLUSIONS

Tubal contractions occur in the presence of normal patency. These contractions can be studied by means of uterotubal gas insufflation and the kymograph. The gas streaming through the tubes at a constant pressure-rate-flow acts as an elastic body upon which tubal contractions register varying degrees of pressure. The character of the contractions is but little affected by the gentle inflow of the gas as comparison with the phenomenon in the surviving specimen without gas insufflation has shown. A rapid flow can cause a certain amount of irritation and is of course to be avoided. Rhythmic waves recorded upon the kymograph and manometric fluctuations indicate in an objective way the presence of tubal contractions. These are absent when the tubes have been ablated or are closed or strictured at any point of its course from the intramural portion to the fimbria.

They are totally absent in the dead specimen of human uterus and tubes. They are not due to uterine contractions which in the nonpregnant state have so far not been demonstrated. This holds true whether the uterine cavity is inflated by means of a closed balloon or whether the inflating gas has free passage as when the tubes are entirely removed from the uterus. The kymographic curves are produced by rhythmic tubal contractions and are not due to elasticity of the tube walls, as they cannot be reproduced by passing the gas through rubber tubing.

They are further evidenced by periodic auscultatory signs through the abdominal wall during the act of insufflating. Bearing down, coughing, sneezing, or any violent diaphragmatic or abdominal muscle contraction influences the kymographic curves slightly but distinctly only when the tubes are actually patent. When the latter are nonpatent these extraneous muscular efforts have no effect upon the kymographic curve.

In the absence of tubal patency and tubal contractions, the kymographic record describes an upward slanting line, and when the highest pressure point is reached it describes a horizontal line which drops when the cannula is withdrawn from the uterus.

The evidence so far adduced points to the fact that certain conditions influence their character and occurrence. In the presence of spasm an initial high pressure is followed by a drop in pressure which is succeeded by the appearance of regular rhythmic contraction waves on the kymograph. Narcosis has been demonstrated as definitely lessening the rate and amplitude. In the presence of cervical regurgitation and the absence of fluctuations, bearing down efforts on the part of the patient will settle the diagnosis. If the pressure rises as a result of these straining efforts it indicates that the tubes are patent but their peristaltic motion is impaired. In cases of doubt this has proved a valuable aid.

Since tubal contractions depend upon ovarian activity their character changes with the particular phase of the menstrual cycle. I have found them also to be definitely affected by such conditions as grave functional amenorrhea in young women and by the preclimacteric and climacteric state. In these conditions the kymographic curves are shallow if at all present and are less frequent to the minute. In many cases of sterility associated with amenorrhea, however, manometric fluctuations are present during tubal insufflation and sometimes they are well marked, resembling the behavior of normal tubes. Although no parallel investigation of the presence and content in the blood of female sex hormone has been carried out in these cases, which appears to be a most desirable procedure, the results here obtained point to retention of tubal peristalsis without sufficient hormone present in the same case to activate the uterus to the full degree of menstruation. Repeated tests of tubal peristalsis have not been undertaken clinically to study the variation in contraction rate and frequency per minute as has been done with excised organs and strips of organs. Such a procedure as blood examination, if systematically carried out, as was done by Dr. Robert T. Frank and his associates for female sex hormone, would yield data that might prove of great help in diagnosing tubal and ovarian function. The findings so far point to the possibility of arriving at a simple diagnostic test of one phase at least of ovarian function; namely, that which influences tubal contractions and therefore ovular transportation.

REFERENCES

(1) *Kehrer, E.:* Arch. f. Gynäk., lxxxi, 160. (2) *Corner, G. W.:* Bull. Johns Hopkins Hosp., 1921, xxxii, 78. Idem., Publ. Carnegie Inst., Washington, 1921, No. 276, p. 117. Idem., American Jour. of Anat., xxxii, 345. (3) *Wislocki, G. B., and Guttmacher, A. F.:* Bull. Johns Hopkins Hosp., Aug., 1924, xxxv, 246. (4 and 5) *Kok, F.:* Mediz. Klinik, 1925, No. 45. Idem., Klin. Wchnschr., 1925, No. 32. Idem., Arch. f. Gynäk., 1926, cxxvii, 384. (6) *Rubin, I. C.:* Jour. Am. Med. Assn., Sept. 4, 1920, lxxv, 661. (7) *Guthmann:* Monatschr. f. Geburtsh. u. Gynäk., lix, 10. Idem., Klin. Wchnschr., 1922, p. 1581. (8) *Henderson, H., and Amos, T. G.:* Jour. Am. Med. Assn., June 10, 1922, lxxviii, 1791. (9) *Dyroff:* Zentralbl. f. Gynäk., No. 34. (10) *Rubin, I. C., and Bendick, A. J.:* Jour. Am. Med. Assn., August 28, 1926, lxxxvii, 657, 658.

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OBSERVATIONS UPON THE COEXISTENCE OF CARCINOMA FUNDUS UTERI AND PREGNANCY*

By Edward A. Schumann, M.D., F.A.C.S., Philadelphia, Pa.

CARCINOMA of the cervix complicating pregnancy is a well-known though fairly uncommon lesion, but the association of adenocarcinoma of the fundus uteri and pregnancy seems not to have been observed, and the possibility of its occurrence is usually dismissed by pathologists with the statement that such combination is impossible.

O. Sarwey[1] says that it is unthinkable that carcinoma of the fundus and pregnancy can coexist, since even though it might theoretically be possible that conception could take place during the incipiency of carcinoma, still the development of the ovum in a uterine cavity, the seat of carcinomatous degeneration, is impossible. He thinks that the earlier reported cases of J. Veit, Chiari, Müller, Bousquet, and Neyronis were probably chorioepithelioma, which had been described by Sänger after their publication.

A review of the literature fails to disclose any detailed reports of cases of this combination, although Müller[2] states that carcinoma of the uterine body is a very rare complication of pregnancy, since the presence of the neoplasm in the fundus acts much more as an inhibition of conception than does the cervical form. When such cases do occur, he says, the growth is usually found springing from the placental site and ordinarily results in abortion. Müller cites two cases of his own, which are not detailed, and one each of Veit and Chiari.

It is difficult to understand just why this coincidence does not occur more frequently. Women subject to carcinoma are said to be beyond the childbearing age usually. But there are many, many cases in which the patient is under forty and still in the full possession of her reproductive powers. Again it is believed that the degenerated carcinomatous endometrium cannot furnish the proper nidus for the ovum, but inasmuch as we know that adenocarcinoma is commonly a small, sharply circumscribed growth for a number of months and that during this period the remainder of the endometrium has undergone no appreciable change, it would seem that such degeneration need not necessarily preclude the possibility of pregnancy. The chemical reaction of the uterine cavity may possibly be altered in the presence of carcinoma, but there is no evidence that this is true. One is rather tempted to believe that possibly those instances in which adenocarcinoma closely follows pregnancy and labor may, indeed, have been cases in which the carcinoma existed in its incipient stages during gestation.

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*Read at the Fifty-second Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 23-25, 1927.

Cullen[3] believes that the occurrence of pregnancy has little to do with the origin of adenocarcinoma of the body of the uterus and reports nineteen cases of this condition, of which ten, or 52 per cent, never had children. Seventeen of these patients were married, and it is a significant fact that six out of the seventeen have never conceived, a far higher ratio of sterility than is found under normal conditions. It is just possible that the cause that prevented conception is in some way responsible for the development of the carcinoma.

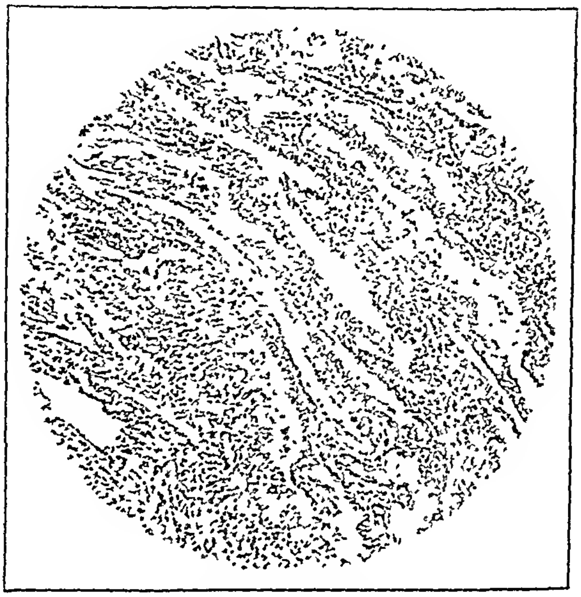

Fig. 1.—Curetted material, showing endometrium with marked glandular proliferation and worm arrangement.

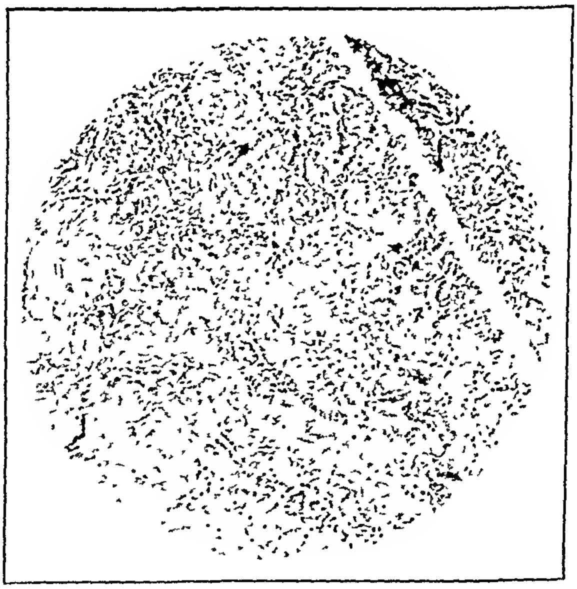

Fig. 2.—Endometrium showing simple glandular hyperplasia and some endometrial reaction.

The clinical diagnosis is manifestly an impossible one, since slight bleeding during the early months of gestation will naturally be attributed to some pathologic condition of the ovum or its envelopes, and there is nothing else to call attention to the fact that an endometrial neoplasm may exist.

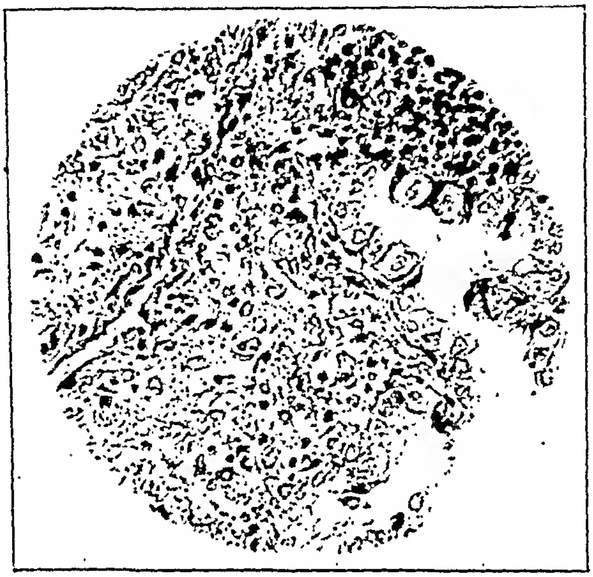

Fig. 3.—Section showing the syncytium with a cell islet at 1.

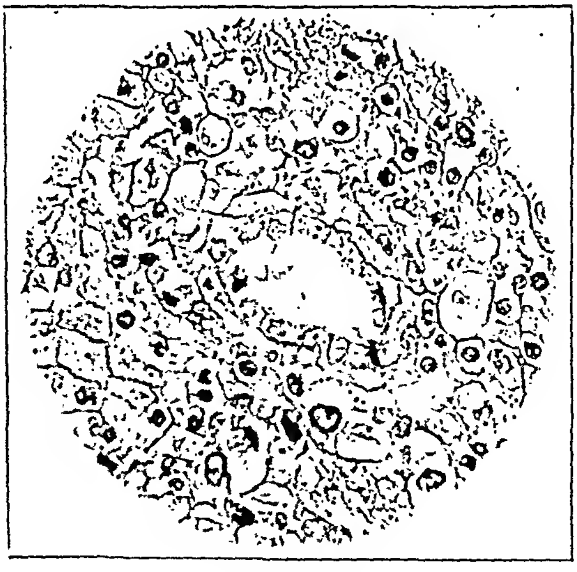

Fig. 4.—The decidua, high power.

The histologic diagnosis of the nature of the tissue also presents great difficulty. Endometrial reaction to the development of an ovum is so various in its form and the behavior of the epithelium often so closely simulates new growth morphology that a definite conclusion cannot often be reached.

The normal changes taking place in the uterine mucosa during early pregnancy are simply an exaggeration of the regular premenstrual alteration, and as Frank[4] clearly states, the mucosa hypertrophies greatly throughout the uterus, particularly at the placental site. Through this hypertrophy the interior of the uterus becomes mammillated and nodular. The stroma reaction is more uniform and greater in degree than that occurring before menstruation. The decidual cells are larger, and, therefore, in sections the tissue looks more like an epithelial than a connective-tissue structure. The glands show marked reduplication so that they are almost in contact in the spongy layer. In the compacta they are few in number, and some appear to have lost their connection with the uterine lumen.

In some instances hyperplasia with the formation of pseudopapillae of the epithelium takes place, giving rise to the so-called glands of Gebhard. Microscopically the picture is startlingly like an epithelial newgrowth even in perfectly normal pregnancy.

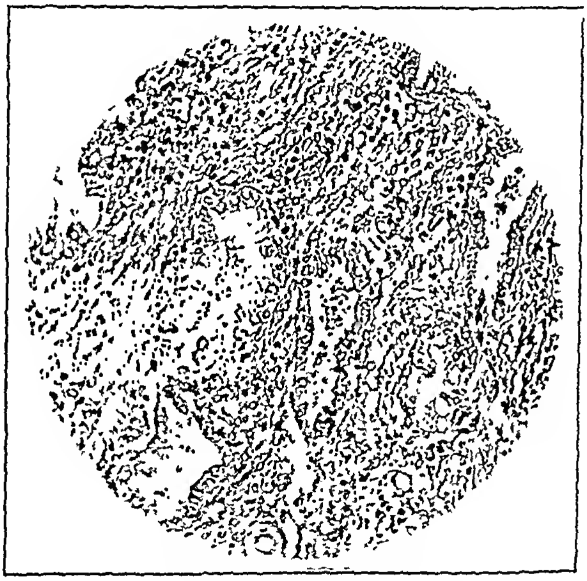

Fig. 5.—Decidua with scattered syncytial cells and some irregular and atypical uterine glands.

Adenocarcinoma of the pregnant uterus may easily be mistaken for chorioepithelioma, especially the form described by Ewing as chorioadenoma; and, indeed, except for the typical glandular changes, the tissue here presented might well come under this classification.

The particular specimen which came under my notice was so puzzling that it was submitted to a number of pathologists, all of whom finally agreed that the cellular morphology and arrangement were definitely that of adenocarcinoma, and the diagnosis was generally concurred in.

The history of the case is as follows: C. J. D., aged forty-three, married, Italian, 10 para, was admitted to the Frankford Hospital September 18, 1925, complaining of uterine bleeding and backache. Her past medical history and her family history were irrelevant. She had menstruated at the age of thirteen, regularly and normally. She had had ten normal labors the youngest child being two years of age; no miscarriages. The last menstrual period began twenty days before admission and had continued intermittently ever since, alternating with a thin, serous discharge. She had some pain in the back which did not radiate and some pain in the lower abdomen. She gave an indefinite history of a similar attack of irregular bleeding and leucorrhea five years previously.

General physical examination was negative, patient being a large, buxom woman, normal as to heart and lungs and with a somewhat pendulous, adipose abdomen. On vaginal examination, the vaginal outlet was multiparous, the perineum relaxed, the cervix hard and dense and without laceration, the uterus was large, boggy, movable, and forward in good position. The tubes and ovaries were negative. There had been no history of a missed menstrual period or any of the early phenomena of pregnancy. The provisional diagnosis was carcinoma fundus uteri. Under gas anesthesia, a gentle curettage was performed.

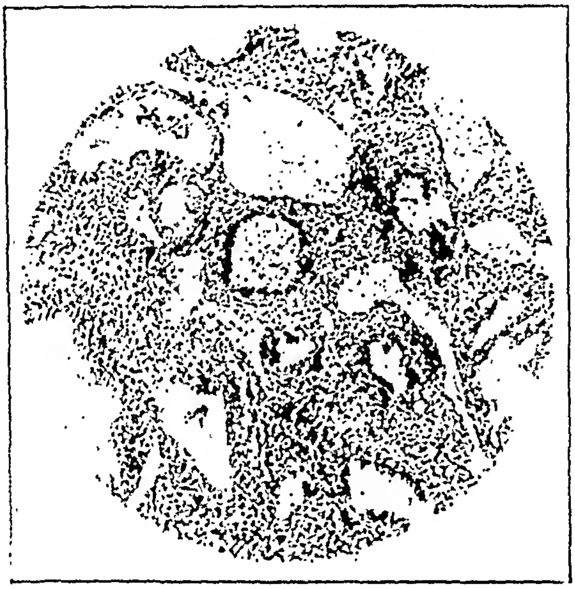

Fig. 6.—Section through the carcinomatous area showing irregular arrangement of glands and breaking of the limiting membrane.

Microscopic examination showed the uterine curettings to be composed practically entirely of glandular tissue, very markedly hypertrophied and showing very active growth, with many mitotic figures. There was a distinct breaking through of the limiting membrane in each case with an oozing, so to speak, of the glandular elements through the limiting membrane and a tendency to form new glands.

Pathologic Diagnosis, Adenocarcinoma of Uterus.—Upon this diagnosis abdominal panhysterectomy was performed on September 28. The uterus was uniformly enlarged to the size of a large orange, was soft and gave the impression of pregnancy. However, it was removed and on sectioning the organ it was found to contain a normal two and one-half months' pregnancy with the sac unruptured. Just under the lower border of the gestation sac was a grayish, necrotic area, limited to the mucosa, somewhat circumscribed to about 6 cm. in diameter. This area did not extend under the placenta, was not elevated above the surface, was not especially vascular, and was everywhere at least 3 cm. above the internal os, with which it had no connection.

The patient made a good recovery and was discharged from the hospital in two weeks. On reexamination twenty months later the woman was found to be in good general health and presenting no evidence of metastasis or recurrence.

The uterus was submitted to Dr. William M. L. Spaeth, pathologist to the hospital, who presented this interesting report: "The specimen consists of the uterus, both tubes and both ovaries. There is also present in the specimen what appears to be a three months' fetus and the placenta with its membranes intact in addition to a large amount of blood clot. On examination of the uterus we find that it is approximately the size of a four months' pregnancy, that it is very soft and friable, that the portion of endometrium about 3 cm. above the cervix has been curetted away and that the fundus below the ovum contains a distinct sloughing cauliflower-like mass. This mass is very intimately attached to the underlying tissues and before it separates from the tissue it breaks, leaving a rough granulated appearance. The confines of the mass are rather well marked 1 cm. beneath the endometrium.

"The cervix presents evidences of old, healed lacerations and many Nabothian cysts. Both tubes are present in the specimen as are the ovaries, but outside of the fact of a few retention cysts in the ovaries there are no gross changes. The fetus measures approximately 8 cm. in length, and the placenta seems to be intact.

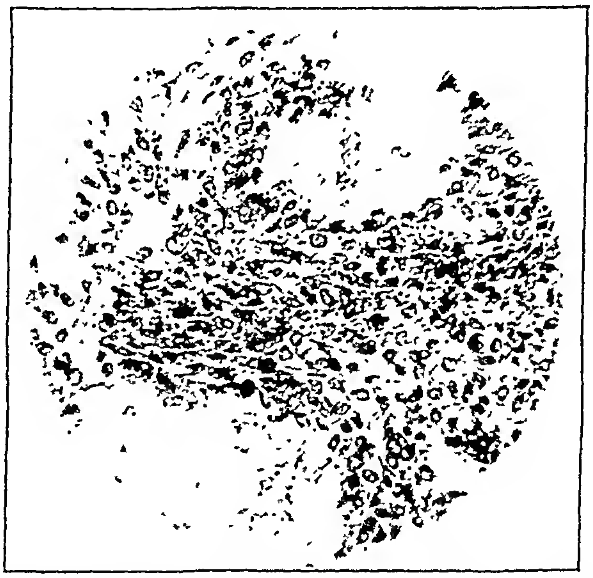

Fig. 7.—High power section showing a mass of epithelial cells, partially divided by stroma and showing only a faint gland-like structure. Many of the cells are broken up, many show mitotic figures.

"Microscopic examination shows a very marked hypertrophy of all the glandular elements of the endometrium. There is a very active overgrowth of all the cells with rapid growth and the production of many mitotic figures. There is a tendency to the formation of many new glands. In addition we find areas which show true placental tissue. The uterine musculature shows much fatty degeneration. The cervix shows a marked degree of fibrosis and evidences of old lacerations and also *chronic inflammatory changes.* Both tubes show chronic inflammatory changes as do the ovaries.

Pathologic Diagnoses.—Adenocarcinoma fundus uteri; uterine pregnancy with placenta and fetus; chronic cervicitis; bilateral salpingitis (chronic); bilateral perisalpingitis (chronic); bilateral oophoritis (chronic); bilateral perioophoritis (chronic); bilateral cystic degenerations of ovaries."

A critical examination of many sections revealed certain characteristics which were definite and peculiar to this growth.

There were present normal decidua, a normal placenta and fetus. Pronounced stroma reaction was found with many large decidual cells and cell islets.

The glands were much reduplicated, showing marked hyperplasia, but throughout there was a breaking through of the limiting membrane and a massing of the epithelial cells outside the confines of the glands, with the typical rain-worm-like convolution of the latter and markedly irregular mitotic figures.

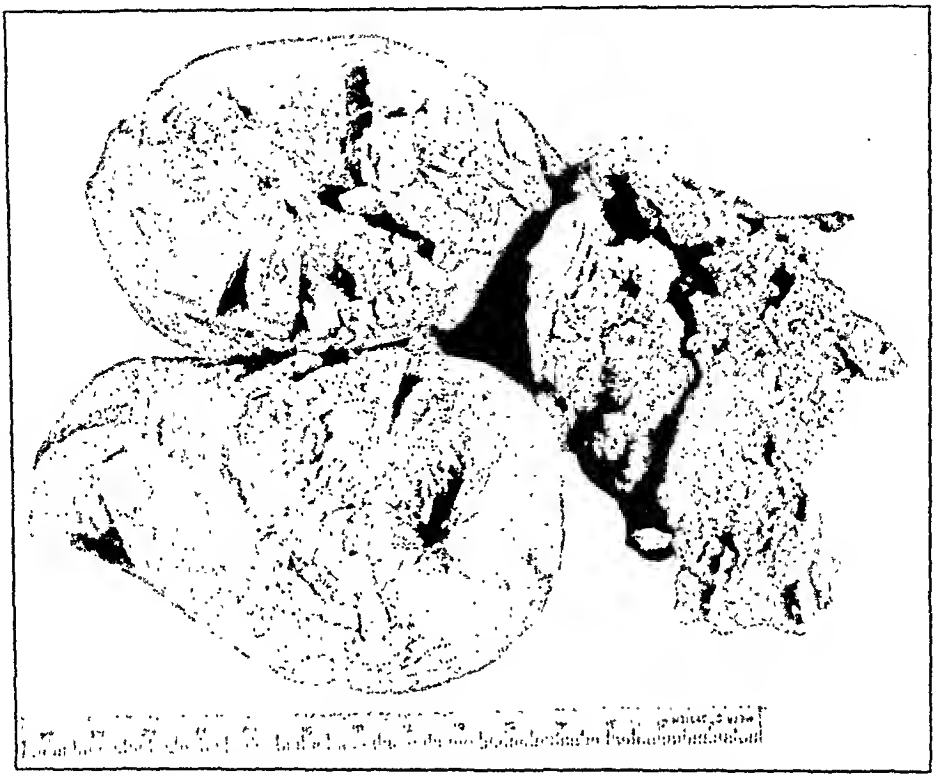

Fig. 8.—Gross specimen. Placenta shown above. Fetus has been removed.

This glandular arrangement was characteristically that of adenocarcinoma and upon it the diagnosis was made of that form of neoplasm as differentiated from chorioepithelioma.

The tumor was entirely extra placental, which is not usually the case in chorioepithelioma nor was there any evidence of the existence of a second placenta, from a twin pregnancy.

REFERENCES

(1) *Sarwey, O.:* Veit's Handb. der Gynäk., iii, No. 2, p. 494. (2) *Müller:* Handb. der Geburtsh., 1889, ii, 879. (3) *Cullen, T. S.:* Cancer of the Uterus, New York, 1900, D. Appleton & Co., p. 652. (4) *Frank, R. T.:* Gynecological and Obstetrical Pathology, New York, 1922, D. Appleton & Co., p. 84.

1814 SPRUCE STREET.

CARCINOMA OF THE UTERINE CERVIX[*]

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IT IS impossible within the time allotted to render a complete discourse on carcinoma of the uterine cervix. The study of the disease, however, offers many practical and important fields, as: (1) The relation of infections of the cervix and of pregnancy to the etiology and the prophylaxis of cervical carcinomas; (2) the study of the extent of the carcinoma in its influence on prognosis and treatment, and (3) the histopathologic character of the tumor tissue and its relation to the prognosis and treatment. These three phases will form the basis of this discussion.

THE RELATION OF INFECTIONS OF THE CERVIX AND OF PREGNANCY TO THE ETIOLOGY AND PROPHYLAXIS OF CERVICAL CARCINOMAS

Several elementary facts may be cited which are of importance in the direct and indirect etiology of carcinoma and in the aim of prophylaxis.

A carcinoma never grows in healthy tissues and organs. It always has a focal beginning. It does not possess a limiting capsule like a benign growth but is infiltrating like the roots of a tree. The tumor forms a continuous dendritic cellular mass. Such growths probably arise from a subepithelial inflammation which stimulates the epithelial cells to proliferate. The chronic inflammation causes a decrease in the differentiation activity of the epithelial cells which then grow into the depths and become atypical.

The most common evidences of chronic inflammations of the cervix are erosions and hyperplasias—the results of infections—and of traumas or lacerations. The infections are mainly gonorrheal, but may be caused by other pyogenic bacteria. Infectious diseases of childhood and the infantile gonorrheal vulvovaginitis not infrequently cause chronic cervicitis. This is an important fact as one might overlook such an occurrence in a nondeflorated woman. In the multiparas infections and inflammations may occur by an ascending route if the vaginal introitus gaps. Bacteria and extraneous substances may find an entrance to the upper vagina. The continued chronic irritation then causes the same changes as mentioned above. A laceration of the cervix may indirectly predispose to chronic inflammation as the everted endocervical mucosa becomes irritated. The profuse leucorrhea may then macerate the squamous cells covering the vaginal portion of the cervix. The defect is covered with cylindrical cervical canal epithelium which can live in the discharge. The cervical erosion has been formed. Culbertson[1] states: "The sequence of development of erosions then consists of infection or trauma, inflammation, leucorrhea and papillary erosions." The varied cellular developments that characterize erosions in the several phases are evidenced in some instances by extensive proliferations of cells, the development and arrangement of which clearly place the condition at the line bordering malignancy, or show that malignant disease is definite: the so-called erosion carcinoma. In other instances the erosion may show a tendency to heal spontaneously when squamous-cell epithelium covers the previously formed glands on the portio. Nabothian follicles and cystic degeneration of the cervix result. The atypical cell proliferation is increased and is often accompanied by disordered growth, intense activity, rapid proliferation, and imperfect organization. Squamous epithelial cells are often seen deep in the glands. The glands may be so closely packed as to suggest strongly the direct development of the alveoli characteristic of malignant disease.

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[*] Read at a meeting of the Chicago Gynecological Society, January 21, 1927.

The deductions that may be drawn from these observations are: (1) Cervical erosions must be treated whenever discovered on examination, whether they do or do not cause symptoms. (2) Every parturient mother should be examined from eight to ten weeks postpartum, and if lacerations of the cervix or extensive relaxation of the vaginal introitus are found they should be repaired by Emmet's trachelorrhaphy and a perineorrhaphy. (3) Erosions that have existed for some years or are very extensive should be excised by a Sturmdorf operation or a high cervical amputation. Subsequent microscopic examinations of the removed tissues often show atypical squamous-cell or adenomatous proliferations that may present every histologic evidence of malignancy. Recent erosions may be successfully healed by the cautery method. However, erosions of wide extent or long existence should be treated by radical surgical measures. If found to be clearly malignant on subsequent microscopic examination then such cases should be treated accordingly. These conclusions, based on microscopic evidence, constitute the prophylaxis of carcinoma of the uterine cervix.

The relationship between pregnancy and the incidence of cancer has been investigated in four hundred consecutive cases of carcinoma of the cervix. The incidence of the number of pregnancies is shown in Table I.

It is apparent from Table I that about 60 per cent of the 400 cases of carcinoma of the cervix occurred in women who had had three or less pregnancies. It seemed possible that such paras were predominant in the United States. Therefore the number of pregnancies was determined in 400 women of cancer age but free of the disease.

TABLE I

	NUMBER OF PREGNANCIES IN CANCER OF THE UTERINE CERVIX		NUMBER OF PREGNANCIES IN 400 WOMEN OF CANCER AGE	
	NUMBER	PER CENT	NUMBER	PER CENT
Nulliparas	59	14.75	73	18.25
Primiparas	78	19.5	56	14.0
Secundiparas	53	13.25	60	15.0
Tertiparas	51	12.75	72	18.0
Nulliparas to tertiparas inclusive	241	60.25	261	65.25
Quadriparas	36	9.0	42	10.5
Sextiparas	34	8.5	28	7.0
Quintiparas	25	6.25	16	4.0
Septiparas	19	4.75	18	4.5
Octiparas	10	2.5	14	3.5
Noniparas	13	3.25	7	1.75
Deciparas	9	2.25	5	1.25
Undeciparas	4	1.0	4	1.0
Duodeciparas	2	0.5	2	0.5
Tertiodeciparas	3	0.75	2	0.5
Quartodeciparas	2	0.5	1	0.25
Quintodeciparas	2	0.5	0	0.0
Total	400	100.0	400	100.0

The results have been placed in the same table. It is interesting to note that the percentages of cancers in the various parities run almost parallel with the percentages of the parities in the noncancerous women. (See Fig. 1.) The teaching that women with many children have cancer relatively more frequently than sterile women or women with few children is therefore not supported by this study. Observations made in Central European families with many children may have led to this deduction on account of the greater preponderance of married women with four or more children in such countries.

We agree with Farrar[2] that the lacerations resulting from the trauma of labor predispose to carcinoma due to the atypical cellular changes occurring in such cervices in the form of eversions and erosions. Kauffmann,[3] in a study of 2000 cases of cancers of the genital canal, observed that no definite relationship between carcinoma of the cervix and the number of children can be established. Numerous births do not favor the appearance of cancer. Inflammatory disease resulting from infections, irritations from without, and traumas apparently are the predisposing causes of malignant disease of the cervix.

THE CLINICAL GROUPING OF CERVICAL CARCINOMAS

Cervical carcinomas should be grouped according to the extent of the disease. Such a grouping facilitates the formation of indications for the proper method of treatment and the study of the efficacy and prognostic value of therapeutic measures. It would seem desirable that some uniform method of grouping be adopted if the full value of comparative studies is to be readily available. The classification used in our clinic[4] since 1916 is as follows: A, the primary; B, the recurrent; and C, the secondary carcinomas. The addition of the secondary carcinomas, as suggested by Ward and Farrar,[5] has been adopted in the grouping. A recurrent carcinoma signifies a renewed activity of the cells after a preceding radium treatment, and a secondary carcinoma means a recurrence after panhysterectomy for carcinoma of the cervix. Table II describes the groups in each class and gives the method of treatment at present employed. Group 1 cases may be treated either with surgery or with radiations. Should such cases prove to be poor surgical risks then radiations are indicated. Complications which contraindicate surgery are grave forms of constitutional diseases as tuberculous infections, diabetes mellitus, severe cardiac disturbances, diseases of kidneys, arteriosclerosis, asthenia, and so forth. The presence of virulent bacteria, especially streptococci, in the cervical secretion also forms a contraindication to hysterectomy. Such patients almost invariably succumb to septic peritonitis. Whether the Ruge-Philipp's virulency test will enable us to predetermine the pathogenic character of such invading bacteria is at

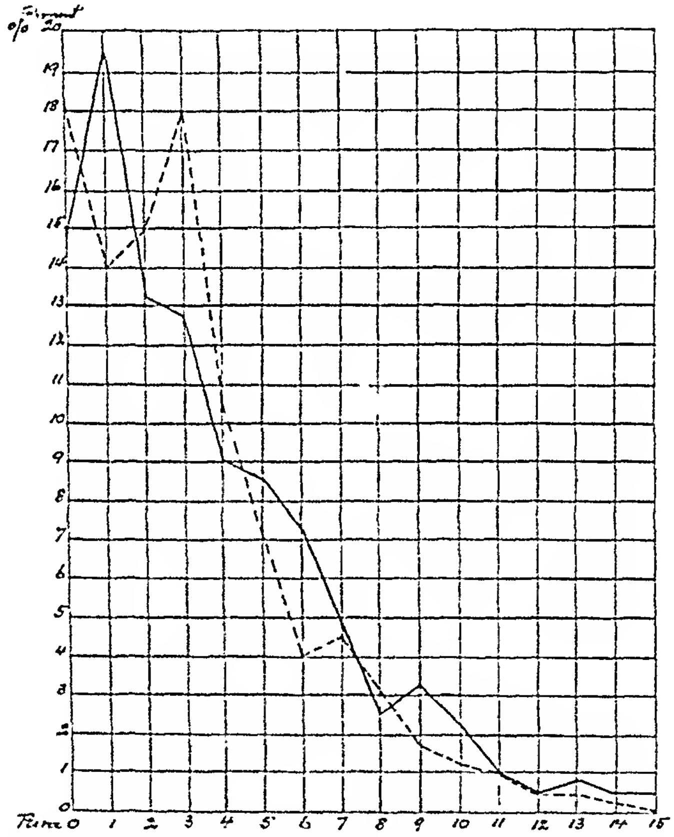

Fig. 1. Graphs of Percentages of Cancers to Parities and of Parities in Non-cancerous Women

present under our investigation. About 20 per cent of cervical carcinomas show the presence of virulent cocci. Such cases are therefore treated with radium.

TABLE II

THE GROUPING OF PRIMARY CARCINOMAS OF THE UTERINE CERVIX

GROUP	PHYSICAL FINDINGS	INDICATED TREATMENT
1.	Clearly localized carcinomas	Surgery or radiation
2.	Borderline cases with wide or peripheral invasion of the cervix and a doughy consistency of the paracervical region	Combined use of radium and x-rays
3.	The clearly inoperable cases with induration of the paracervical tissues and the parametria which are not fixed	Combined use of radium and x-rays
4.	The terminal cases characterised by fixation of tissues or the frozen pelvis	Palliative and symptomatic treatment

TABLE III

GROUPING OF RECURRENT AND SECONDARY CARCINOMAS OF THE UTERINE CERVIX

GROUP	PHYSICAL FINDINGS	INDICATED TREATMENT
1.	Local recurrence, clearly localized	Combined use of radium and x-rays
2.	Parametrial recurrence, without local recurrence	Combined use of radium and x-rays
3.	Local and parametrial recurrence	Combined use of radium and x-rays
4.	Fixation of tissues	Palliative and symptomatic treatment

In a series of 183 cases of primary cervical carcinomas treated with a combination of radium and x-rays during the years 1914 to 1920 inclusive, the following results were obtained:

Groups:	1	2	3	4	Total
Total number:	10	21	93	59	183
Five-year healings:	8	7	11	0	26
Per cent:	80.0	33.3	11.8	0	14.2

If the untraced cases, namely 57, are subtracted from the total, then 126 cases were followed up for five years, a curability of 20.6 per cent.

The operable cases number 31 with 15 five-year end-results, or a relative curability of 48.4 per cent. The cases belonging to Group 4, characterized by a frozen pelvis or fixation of the tumor, have all succumbed to the disease. Such cases should not be treated with massive radiations with the expectation of arresting the growth of the tumor. They offer an absolutely bad prognosis.

The clinical grouping of cervical carcinomas, therefore, facilitates the selection of the proper method of treatment and offers a means for estimating the probable efficacy of the treatment.

It is interesting to compare results of treatment of cervical carcinomas in various clinics, dividing the cases according to the method of treatment. The percentage of relative cures means the number of operable cases well after five years.

In estimating the value of the three methods of treatment the percentages of the relative cures should be compared as they represent the number of five-year cures in the operable cases. The absolute cures mean the five-year cures obtained in all cases admitted to the respective clinics. It is obvious that many more advanced and inoperable cases are admitted to the radiologic departments than to the surgical divisions. Hence the percentages of absolute cures in these clinics must be low.

TABLE IV

FIVE-YEAR END-RESULTS WITH VARIOUS METHODS OF TREATMENT

CLINICIAN	OPERABILITY PER CENT	TOTAL NUMBER	TOTAL NO. LIVING	RELATIVE CURES	ABSOLUTE CURES	METHOD OF TREATMENT
Clark, J. G.	17.0	140	12	27.2	8.6	Radium
Bailey and Healy	28.2	165	23	34.1	13.9	Radium
Kehrer	45.7	129	36	40.7	27.8	Radium
Ward and Farrar	23.6	72	17	52.94	23.6	Radium
Heyman	16.6	217	44	40.5	20.3	Radium
Doederlein	32.6	755	103	30.3	13.2	Radium and x-rays
Baisch	51.0	198	28	23.8	14.1	Radium and x-rays
Schmitz	16.94	183	26	48.4	14.2	Radium and x-rays
Martzlaff	52.1	387	102	46.5	26.6	Surgery
Stoeckel	70.6	350	98	35.4	26.6	Surgery
Graves	64.0	181	34	34.2	18.5	Surgery

THE HISTOPATHOLOGIC CHARACTER OF CERVICAL CARCINOMAS IN RELATION TO THE PROGNOSIS OF TREATMENT

The observation may be frequently made that a primary cancer of clinical Groups 1 and 2 did not respond to treatment, though a relatively good prognosis was justifiably rendered. The patient either succumbed to the progressive growth or to a recurrence appearing within a short time after treatment, either surgical or radiologic. Undoubtedly carcinomas occur which show marked degrees of pleomorphism or undifferentiation. They are so highly malignant that the indicated treatment is powerless. The histologic malignancy of the growth is one factor in such hopeless cases; the extent of the growth is another; and loss of avidity of the carrier, that is, total absence of carcinolytic reactive powers in the serum of the host, is probably a third reason. We are, however, concerned in this paragraph only with the histopathologic aspects of carcinomas. It has already been shown that clinical Group 4 cases give an absolutely bad prognosis.

A study of the morphology of cervical carcinomas has been made by Schottlaender and Kermauner,[6] Alter,[7] Martzloff[8] and others.

Martzloff reports a better end-result of treatment in spinous-celled carcinomas, namely, 47 per cent; in the round-celled types, 24 per cent, and in the spindle-celled types, 9.5 per cent. Greenough[9] found a very definite relationship between the degree of malignancy and the prognosis of breast carcinomas. Four classes of malignancies were distinguished from low to high according to the degree of *anaplasia* as expressed in the irregularity in size and shape of cells and nuclei, hyperchromatism, functional activity, and mitoses. The results of treatment in each class were:

GREENOUGH'S RESULTS

CLASS	PATHOLOGY	NUMBER OF CASES	NUMBER OF CURES	PER CENT OF CURES
1	Much differentiation	6	4	66.67
2	Moderate differentiation	19	9	47.37
3	Slight differentiation	43	10	23.26
4	Highly malignant	22	0	0

Broders[10] has shown a very definite connection between the cellular differentiation and undifferentiation of carcinomas and the good clinical end-results obtained after treatment. He recognized four grades of carcinomas.

BRODERS' RESULTS

GRADE	PATHOLOGY		NO. OF CASES	PER CENT	PER CENT GOOD END-RESULTS
1	Differentiation Undifferentiation	100 to 75 per cent 0 to 25 per cent	82	9.31	90.20
2	Differentiation Undifferentiation	75 to 50 per cent 25 to 50 per cent	407	46.25	66.16
3	Differentiation Undifferentiation	50 to 25 per cent 50 to 75 per cent	282	32.04	24.82
4	Differentiation Undifferentiation	25 to 0 per cent 75 to 100 per cent	109	12.38	10.09

Hueper and I[11] studied the pathology of 139 cases of cervical carcinoma. The factors used in the study of anaplasia comprised the cell type, the irregularities in size and shape of cells and nuclei, distinctness and clearness of cell wall, functional activity of cells, hyperchromatism and prophases, and mitoses. A numerical malignancy value was given to each one of the factors. The sum of these values was termed by Hueper the "Histologic Malignancy Index." The lowest index attainable is 10, the highest 40. The cases were divided into four groups, namely, malignancy index 10 to 20; malignancy index 21 to 25; malignancy index 26 to 30; and malignancy index 31 to 40. The end-results were known in fifty cases. The clinical Group 4 cases numbered eight and, being hopeless, were omitted.

A rise in the malignancy index causes a decrease in the percentage of good end-results. The same observation was made in the series of

SCHMITZ' RESULTS

GROUP	PATHOLOGY	NO. OF CASES	NO. OF GOOD END-RESULTS	PER CENT GOOD END-RESULTS
1	Malignancy index 10 to 20 Average 15.67	13	10	76.97
2	Malignancy index 21 to 25 Average 23.17	14	6	42.86
3	Malignancy index 26 to 30 Average 26.41	11	3	27.27
4	Malignancy index 31 to 40 Average 33.33	4	0	0

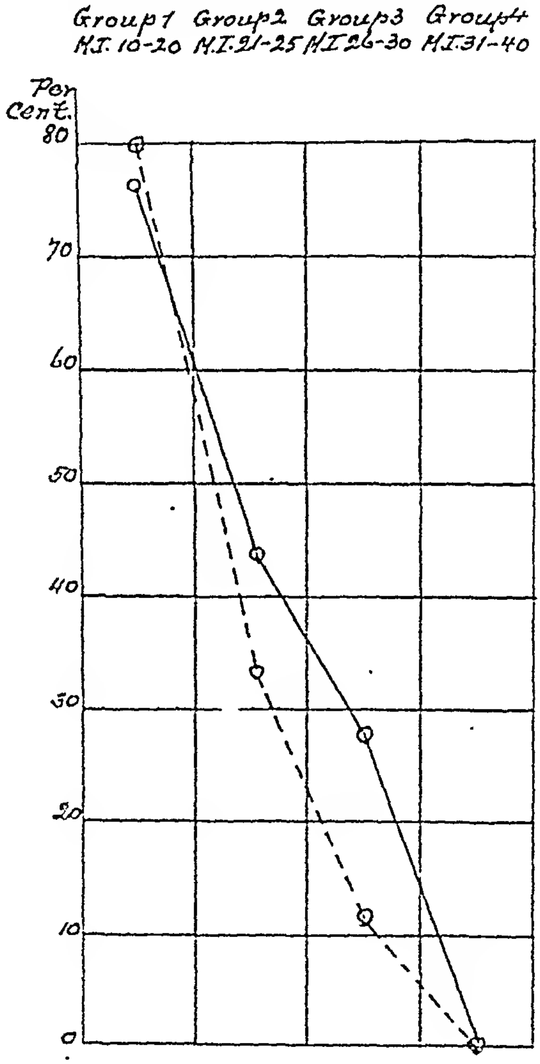

Fig 2. Graphs of Histological Malignancy Index and Five Year End Results.

———————— Malignancy Index

- - - - - - - - Five Year End Results.

five-year end-results classified according to the clinical groups. As the local extent of the carcinoma increased so the number of five-year healings decreased. An investigation is now being conducted to determine whether the degree of histologic malignancy index is dependent on the duration of the disease, that is, whether the index increases in height with the increase in the duration of the disease.

DISCUSSION

The interpretation of the prognostic value of the malignancy indices and of the clinical grouping of the carcinomas according to their clinical extent may be facilitated by projecting the percentages graphically. The abscissae represent the percentages and the ordinates the clinical groups and the malignancy index. (See Fig. 2.) The graphs of the five-year end-results and the malignancy index are almost parallel. Two facts stand out clearly: (1) The clinical Group 4 cases characterized by fixation of tissue and regional lymph-node involvement give an absolutely bad prognosis. (2) Carcinomas having a malignancy index above 31 corresponding to Broders' Grade 4 and Greenough's Class 4 offer the "worst" prognosis. A malignancy index above 31 is shown to be 100 per cent within the "worst" progno-

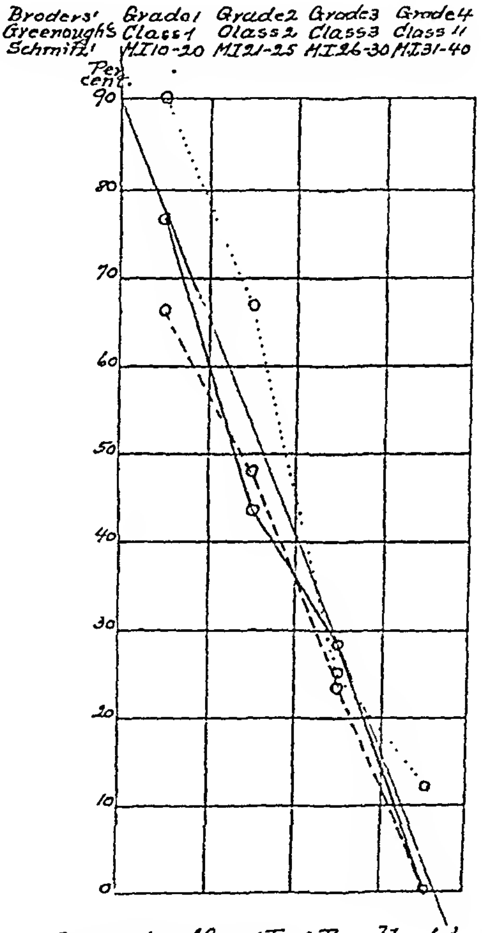

Fig. 3. Graphs of Good End Results determined from Degree of Anaplasia.

.... Broders' Results. - - - - - Greenough's Results.

———— Schmitz' Results. Straight Line = Malignancy Line sis. The clinician may have to consider these two facts in the prognosis and treatment of carcinomas.

The results reported by Broders, Greenough, and me also, may be plotted as seen in Fig. 3. Differences between Greenough's and my results are negligible. The better results of Broders may be due to the fact that a much larger number of cancers formed the basis of his findings. All agree that high malignancy is shown by cells and nuclei of irregular shape and size, without secretory function, and arranged in solid columns, large or small, together with numerous and irregular mitoses and hyperchromatism. The degree of malignancy of a carcinoma can be determined with a reasonable accuracy by study of the histology of the tumor.

An average of the three percentages in each grade may be taken. For Grade 1 it would be 77 and for Grade 4 it would be 3.4. A line drawn through these points strikes the percentage 53 in Grade 2, and 29 in Grade 3. These percentages coincide with those of the averages in each grade. This straight line, therefore, may be termed the "malignancy graph." The graph represents the probable range of averages of good end-results in each grade or group. In Grade 1 the percentage of good end-results may vary from 90 to almost 67 per cent; in Grade 2 from 67 per cent to 42 per cent; in Grade 3 from 42 to 12 per cent; and in Grade 4 from 12 per cent to 0. The good results of treatment reported by Broders, Greenough and myself are contained within these limits.

CONCLUSIONS

1. Cervical erosions and hyperplasias resulting from infections, inflammations or traumas should probably be considered as some of the potentially predisposing causes of cancer. A surgical correction of lacerations of the cervix and perineum in recent traumas, and an amputation of the cervix with erosions or hyperplasias of long standing, are deemed advisable. A definite relationship between carcinoma of the cervix and the number of labors could not be established. Numerous births apparently do not increase the liability to cancer. On the other hand injury of the cervix from birth trauma resulting in chronic proliferative changes may be considered as predisposing factors of cancer.

2. The indications for the treatment of cervical carcinoma should be based on the clinical grouping. The grouping is determined solely from the extent of the growth. Group 4 cases are characterized by fixation of tissues and offer an absolutely hopeless prognosis.

3. The determination of the degree of histologic malignancy enables a physician to render a relative prognosis in the treatment of cervical carcinoma. A high degree of anaplasia is always associated with a bad prognosis, while a high degree of differentiation usually means

a good prognosis of treatment unless a case should belong to clinical Group 4. The clinician will probably have to consider the histologic malignancy index in selecting the method of treatment.

REFERENCES

(1) *Culbertson, C.:* Jour. Am. Med. Assn., 1926, lxxxvii, 1808. (2) *Farrar, L. K. P.:* Surg., Gynec. and Obst., 1926, xliii, 719. (3) *Kauffmann, E.:* Zentralbl. f. Gynäk., 1926, i, 198. (4) *Schmitz, Henry:* Med. Rec., July, 1926. (5) *Schmitz, Henry:* Jour. Am. Med. Assn., 1925, lxxxiv, 81. (6) *Schottlaender and Kermauner:* Das Uteruskarzinom, Wien, 1912. (7) *Alter, N. M.:* Jour. Med. Res., 1919, xl, 241. (8) *Martzloff, K. H.:* Bull. Johns Hopkins Hosp., 1923, xxxiv, 141. (9) *Greenough, R. B.:* Jour. Cancer Res., 1925, ix, 453. (10) *Broders, A. C.:* Arch. Surg., 1925, xi, 43. (11) *Schmitz, Hueper, and Arnold:* Am. Jour. Roentgenol., 1926, xvi, 30.

22 EAST WASHINGTON STREET.

(For discussion, see p. 685.)

A GYNECOLOGIST LOOKS AT PROSTITUTION ABROAD

WITH REFERENCE TO ELECTROCAUTERY TREATMENT OF GONORRHEAL CERVICITIS AND URETHRITIS*

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IN THE world-wide contest with disease one finds spectacular retreat on every field except three. The first of these, cancer, can, however, claim able organization and educational campaigns for early diagnosis and operation, for long research and for the study of irradiation. As to the combat against the second, the most common disease transmitted by prostitution, the group of men which has taken least part is that group which is most concerned. The gynecologists are the men most concerned because their patients pay the great penalties of gonorrhea in sterility, invalidism, obstinate infections and mutilating operations. We have been too busy digging into and perfecting the technic of what constitutes nearly one-fourth of major surgery to consider prevention.

As to the third stalemate which is the chief of all medical failures, the mortality and morbidity of childbed, our national medical societies fight government help. Thus it happens that in our specialty there are found the two universal diseases which are not yielding to modern sanitary progress and which are not subjected to wholehearted marshalling of the opposing forces.

Furthermore, while one is grouching, it would be in tune to draw attention to the way we hold aloof in our college courses and societies and journals from the chief field for preventive gynecology, sex education in the medical sense, covering such items as premarital examination, the office confessional with admonition, or birth control instruction where properly due. Indeed, whenever we decline to take any official part in world problems which fall directly within the scope and practice of our specialty (like sterilization and birth control), it is with a poor grace that we refuse help or guidance to the lay organizations that try to make up for our neglect.

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In the fifty years of the life of this society of specialists on diseases of women, and among its fifteen hundred published papers, this is the first time that the word "prostitution" has dared to show itself in a title. Furthermore, the organization that had Noeggerath for a member has not had the word *gonorrhea* among its captions as often as once in two hundred papers.

DISCOURAGEMENT ABOUT CURE OF GONORRHEA

In a visit to fourteen countries made last year by the Secretary of the Committee on Maternal Health there was encountered a general expression of opinion that the present methods of diagnosis and treatment of syphilis give the strongest hopes for steady recession and, in the more civilized and controlled parts of the world, for eventual conquest of the disease. This was in strong contrast to the feeling about gonorrhea. "The more obstinate forms of infection of the cervix," several men of large experience said, "are incurable." The inscribed and arrested prostitutes were found to be in the hands of able specialists in dermatology-syphilis in the large cities that were visited but their prominent gynecologists seemed to take no part in the troublesome problem. As an important side issue bearing on our Committee study of sterility it was therefore deemed advisable to inspect the technical methods of diagnosis and treatment.

If one had no qualifications for gauging the effectiveness of diagnostic methods, at least one could make an attempt to determine whether there might not be some items of our treatment worthy of trial. This aspect of the treatment question abroad is of an importance not to be exaggerated. In this country when a patient has received sufficient benefit to alleviate or remove the symptoms, or when she is discouraged, she disappears. There is little chance of getting her to return several times, even with a follow-up letter or call, for tests needed to make sure that contagiousness has disappeared, the only exception being in anticipation of marriage. But in the municipal clinics to which the police refer prostitutes the arm of the law reaches out and brings back the delinquent who disregards a written notice. And she is obliged to come any number of times.

Action is desirable at this particular time because abrogation of reglimentation and inscription is proceeding so rapidly that enforced return may not be available in a few years to help us to study end-results of various treatments.

There is the greater need of certainty of cure because our diagnosis of persistence of infectiousness or freedom from risk has many loop holes. In the detailed studies of Bettman or Haustein the difficulties of diagnosis are not boggled. Except in acute conditions or marked cases, dependence on single microscopic tests or cultures is illusive. Even with the expertness of the best men like Neisser and Buettner one finds in 1308 examinations of prostitutes, in police work, only 23 per cent of positive diagnoses. The more careful study in hospitals by Bergh, Lappe, Schultz, or our own Pryor, found, in 5816 cases, 51 per cent of undoubted gonorrheal infections. Lochte detected, in cases that clinically presented no suspicious evidence, 16 per cent gonococci in single examinations, but 34 per cent when three to four tests were made. Palmer Findley had an opportunity during the World War to segregate women arrested in the vicinity of army camps and to keep them under observation two or three months. With 30 per cent positive at the first examination, 92 per cent were positive with tests carried ten days. Curtis (1919) doubts such extensive success in finding the gonococcus. While practically all leucorrheas in women who have not borne children are called by him the result of this kind of infection, the gonococcus has disappeared in most instances when the patients appear. Bettmann (p. 115) shows how infectiousness may show up on one day and be absent on another. He demonstrates how often women infect their clients notwithstanding repeated negative findings. The difficulties are increased owing to the means taken by the professional before examination in the way of douches, massage of the urethra and even treatment by a doctor.

Secretion from the vulvovaginal glands is not easy to secure. From the urethra the platinum loop or blunt spatula is the preferred method. The urethral glands present considerable difficulties in diagnosis. Bergh found 151 infected urethras in 672 public prostitutes and 556 in 2558 clandestine prostitutes and proved the rebellious character of diseases in this concealed area.

In the cervix clear mucus often harbors rich bacterial flora. Here again the spatula or the loop or aspiration secures the specimen. It may be said that standard examinations average twenty minutes, from forty-five minutes to two hours being the outside limits. Jadassohn asserts that a doctor can, with the assistance of a technician of sufficient experience, bring the tests down to six or eight minutes. Baermann in fourteen days tested 393 prostitutes for gonococcus, using in each case two preparations from the cervix and two from the urethra, one with methyl blue stain and the other by the Gram test. The control of about 35 prostitutes, in daily sessions of one and a half hours, was undertaken, the microscopic search of 140 preparations taking five hours. The urethral secretion takes first place in importance. Baermann, for instance, found in the vagina, 5 per cent of gonococci; in the vulvovaginal glands, 11 per cent; in the rectum, 8 per cent; in the urethra, 70 per cent, and in the cervix, 45 per cent, in groups of prostitutes.

The Continental statistics concerning prevalence and comparative frequency of location have been well presented by Bettmann (pp. 97 to 136) and Menge. The most satisfactory and substantial treatise in English on gonorrhea is the large volume of Norris with its full bibliography. While stressing the value of clinical findings, he fails adequately to picture the appearances viewed in office examinations of the cervix and urethral glands. My later detailed report will do this, particularly with regard to the urethral glands and the varieties of chronic cervix inflammations, as I have made a life size sketch of the region in most cases, and in many a diagram for each visit.

The attack on gonorrhea should be more readily made effective by systematic removal of infections in the female than by centering chief attention on the male, because there are from one-fifth to one-third of the number of infections found in the former. The canvass of every doctor's office in Detroit in a given day in May, 1926, by representatives of the American Social Hygiene Association, showed three times as many males as females asking treatment for gonorrhea. The figures were taken to mean that within the year one Detroit woman in 50 had symptoms enough to call for care. From the same source we learn that in the other city (Atlanta), completely surveyed for the year 1926, gonorrhea was reported to the Board of Health twice as often as syphilis. One in ten of the inhabitants applied annually for treatment for venereal disease. The incidence among males agreed with that of Berlin for 1900. The study by the Public Health service and the Association is covering seventeen cities and counties this year.

With gonorrhea an underestimate of prevalence is always likely because of the number of mild cases and the frequency of self-treatment. In women an active infectiousness is compatible with no more bother than a mild leucorrhea and a moderate irritability of the bladder.

Flexner in his study of prostitution says we have no state where a statute against prostitution is enforced; that no American community can be induced to penalize voluntary immoral relations, even though the women regularly earn their livelihood in this way. Yet he shows that commercial exploitation and red light districts, disorderly houses and street walking can be suppressed by any city administrator and that such action will be sustained by public opinion. He is convinced, after his survey abroad and here, that making prostitution clandestine is a gain. He outlines a constructive program. Lessening the incentives to lust, diminishing the number of defectives, combating alcohol, ignorance and bad and broken homes, must be combined with provision of innocent, healthful, alluring recreation by the community.

Flexner's remedies are basic but long to apply. Our own responsibilities may touch only one part of the evil, but the assistance we can give may be put to work at once by lessening the number of foci of infection.

The men treating gonorrhea in prostitutes feel most discouraged about the cervix. The general report in the literature is that the gonococcus is more often detected in the urethra than in the cervix, but it seems to be thought more accessible and amenable in the former location. Menge found it present in the cervix in 95 per cent of all chronic gonorrheas in women. The branched, cervical glands with their narrow openings present peculiarly unfavorable conditions for applications to reach the ramifications of these pockets, as Norris (p. 98) shows. This is a strong argument for the sterilizing preparation of heat.

THE HEAVY CAUTERY TREATMENT

In summarizing the claims for the cautery for rebellious infection of the cervix and meatus (for in this year the cautery treatment comes of age) the one point besides its high percentage of cures on which stress should be laid and in which it challenges comparison with every other method, is the infrequency with which it needs to be applied. Nearly all other methods, such as diathermy, Bier suction, injection of mercurochrome or alcohol, and silver preparations, call for repetition every two to four days for several weeks or months. The cautery is used one to three times at intervals of one to three weeks.

Dr. Guy L. Hunner of Johns Hopkins devised the method. His original statement covers so many important points that his technic should be quoted in full.

> "During my early association with Dr. Kelly we often treated cases of cervical gland hypertrophy by making multiple radial incisions within the external os by means of a scalpel. This opened many of the dilated cervical glands, or Nabothian follicles, and allowed their mucous contents to gush out. I often noticed, however, that after recovery of such patients from their principal operation the cervical condition did not seem to be altered. Later it was our custom to take the hot blade of a Paquelin cautery and run it about over the hypertrophied mucosa of the cervix. This destroyed the superficial layers of tissue, causing a temporary necrosis. But as soon as the surface epithelium was replaced the leucorrhea seemed to be as profuse as ever. My method grew out of these two, and consists in radial incisions deep into the cervical tissues by means of the cautery blade. I believe the other two methods failed because the incisions with the knife-blade simply emptied and failed to destroy the dilated cervical glands, while the surface application of the cautery failed either to empty or to destroy the deeper glands. The deep radial cuts with the cautery empty the deep cervical glands and cause such a wide necrosis of tissue that many of these deep glands are obliterated in the healing process.
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> One great advantage of this method is that it may be applied *in office practice* without giving anesthesia of any kind. With the patient in the dorsal or lithotomy position, a broad-bladed Sims' speculum is introduced into the vagina, the anterior

> lip of the cervix is firmly grasped with a tenaculum forceps, and the cervix is pulled down as near the vulvar orifice as possible. The nurse or assistant stands by with the cautery already heated. On transferring the cautery to the operator the nurse continues to work the cautery bulb with one hand, while she retracts the Sims speculum with the other. The operator retains the tenaculum in one hand and manages the cautery with the other. The strokes should be made one at a time, the cautery being removed from the vagina after each stroke as the patient feels the radiated heat on the vaginal walls. The patient is warned that she will feel the heat but that she must not move, as there will be no actual pain.
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> The number and depth of the radial strokes depend largely on the condition of the cervix, but in general I make five or six strokes at each treatment and burn to a depth of 2 to 5 mm., or, roughly, from one-eighth to three-sixteenths of an inch. The length of the stroke naturally varies with the conditions present, but it should extend over the area of the hypertrophied cervical mucosa, which generally covers all of the mucosa in sight. The treatments are given once in three weeks. A sterile strip of gauze is left in the vagina to take care of possible hemorrhage. The patient is instructed to withdraw this the next evening, and she is warned that the leucorrheal discharge during the first week or ten days will be more profuse than ever and that she may have some slight bleeding. She is instructed to go to bed and remain there if the bleeding is at all profuse. I have not known hemorrhage to take place the day of treatment, but there is often a little hemorrhage after three or four days when the necrosis of tissue is at its height, and in one or two instances this hemorrhage has been sharp enough to alarm the patient. A daily douche is recommended during the interval between treatments. I have had three treatments produce such a beneficial effect in a marked case of leucorrhea that the patient considered herself cured and did not come for further treatment. The usual number of treatments ranges from three to six, and the greatest number of treatments I have given any patient is ten. I operated on this patient in August, 1903, during an acute attack of gonorrheal peritonitis, and did a supravaginal amputation of a myomatous uterus, associated with gonorrheal pus tubes. After recovery from the operation she continued to have a profuse leucorrheal discharge from a lacerated and hypertrophied cervix. After ten cautery treatments the cervical mucosa was devoid of any evidence of inflammation and there was no leucorrheal discharge.
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> I have found the chronic gonorrheal cases the most obstinate ones to treat, it being necessary to destroy all of the deep cervical glands before the leucorrhea ceases. Another important consideration in these gonorrheal cases is that you may be able to reduce greatly the leucorrhea without stopping it entirely. In other words, the cervical catarrh may cease under the cautery treatment, but the leucorrhea may continue more or less profuse because of the endometritis and the metritis which are occasional sequelae in an ascending gonorrheal infection. But many gonorrheal infections do not gain a foothold higher than the cervix, and some which do go higher are taken care of by nature and leave no permanent lesions beyond the cervix. These cases may be classed as curable by the cautery method.
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> The quickest and most brilliant results are obtained in the cases of cervical hypertrophy and eversion of the mucosa due to multiple childbirth.''

Hunner still employs the thick Paquelin blade to the exclusion of the electric cautery.

Cashman (1924) says that chronic cervicitis, except in superficial infections, is only curable by eradication or destruction of the deep glands; that cauterization is the simplest procedure, and such cure is the most potent prophylaxis against cancer. "The conversion of a moderately lacerated cervix and profuse mucopurulent discharge into a normal looking cervix, resembling the nulliparous, with no discharge, is really remarkable.'' For five years he has employed the Downes electrocautery knife, burning the lining of the entire cervical canal at one sitting to a depth of one-eighth inch, and below the external os using six or eight radial incisions about one-fourth inch deep, the treatment being given in the hospital. Skene's glands are also cauterized and Bartholin's excised if necessary. The slough separates in seven to ten days, oozing being no more than at a period. Four weeks after operation the canal is dilated in the office, *thereafter weekly four or five times to prevent the stenosis otherwise not infrequent.* It will be seen that hospitalization and regular dilatation are involved in this adaptation of the Hunner procedure in comparison with the simple office technic when using a nasal cautery.

THE FINE WIRE CAUTERY

In 1906, having read Hunner's paper, I began to use and to teach the use of a simple and effective modification. Ready to hand was the outfit used in the nose, completely adapted for the cervix and urethra. The method was published with pictures in 1904 and 1911 for the meatus, and 1921 for the cervix.

The tip most often used is the simple narrow loop of platinum wire one cm. long or the spiral of about one-half that length. The former lays stripes along the raw areas of the inside of the cervical canal or punctures cysts. The spiral works fairly well up in the canal. A porcelain core inside the spiral,* while it is a little clumsier than the open spiral, has the advantage that a burnt core of mucus cannot clog the interstices of the platinum wire. The slender shaft or shank without crevices is made by Mueller of Chicago. None of the handles are perfectly satisfactory, but the Mueller has the broadest contact. The current is controlled by one of the outfits used for the toy trains of children at much less cost than those provided by instrument dealers, but this is said not to be free from danger of shock. With the direct current the whole outfit purchased from instrument houses runs up to $35 for the alternating current, and for the direct current $55 to $85. That form of generator which makes a vicious spitting noise and may be used with any current is prone to alarm patients, but it is handy in being portable for work outside the office. Even the hum of the ordinary motor used with the direct current is objectionable. This should be silenced by hanging the motor in another room or in a closet or, better still, in the cellar. The switch with which it is started, however, is to be located close to the gynecologist's seat. A cherry red heat is as effective as a white wire and does not cause bleeding. On granular areas a tiny gutter is quickly burned at three-eighths inch (one centimeter) intervals. For small areas punctures are made. Two to three weeks later intermediate areas may be attacked if any are still granular. Before treatment the surface should be painstakingly wiped dry. When the catarrhal secretion in the canal is adhesive, strong alkaline solutions have some effect, but the best mechanical method is a very narrow strip of rough gauze twisted into the canal to entangle the mucus. A piece of inch wide bandage carried in on a very narrow forceps works well. Suction may be tried.

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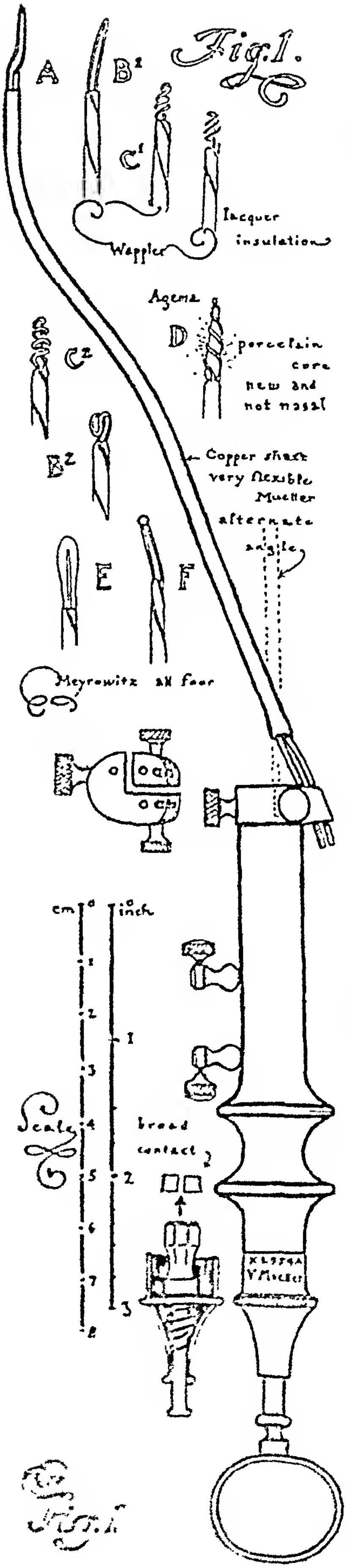
*Made for me by Agema, of Berlin.

The most obstinate form of gonorrheal endocervicitis is that which inhabits the canal high up, distends it with sticky mucus difficult to remove, and lines its cavity with a gristly surface which imparts to the tiny Dickinson curette, or to the sound or probe, a sensation resembling that produced by scratching the back of linoleum or Brussels carpet. Such a canal is carefully dried out. A single tenaculum steadies the external os if necessary, while a longitudinal application of the heat is made along the whole of one side from internal to external os. Then the opposite side of the passage is treated in the same manner. It is only in the canals almost large enough to admit the finger that more than two stripes need to be made at the first session. Two to three weeks later on the sides not touched identical stripes may be made if necessary, but it is surprising how often the double stripe suffices, and such initial reserve is supposed to be desirable for fear of undue narrowing of the channel. In twenty years I have yet to see a stenosis or need to use a dilator as a result of the cautery, and I have sent for a number of cases treated many years ago for aggravated infection in order to verify this statement. The stenosis reported by Cashman has been due to the wide slough produced by the broad Paquelin blade and to adhesions of granulating areas. This is not seen with the narrower stripe. A certain number of patients are sensitive and will need bleaching by adrenalin combined with the anesthesia produced by novocaine. The preliminary cleansing will determine sensitiveness and tell which cases call for local anesthesia.

The cystic cervix is especially adapted to cautery treatment. There are surfaces so deeply riddled with cysts that only amputation or Sturmdorf coning will relieve the pressure ache, but even these are worth trying to cure with the fire-needle for the reason that unexpected success has developed in cases apparently belonging exclusively to surgery. As one crop of surface cysts is sterilized and destroyed by heat, the deeper group come to the surface and the marked shrinkage of the whole cervix makes them accessible. At any given session every cyst that can be located should be punctured. In the depths of a large cyst the wire is moved about in order that complete obliteration may result. The sloughy opening insures against closure be-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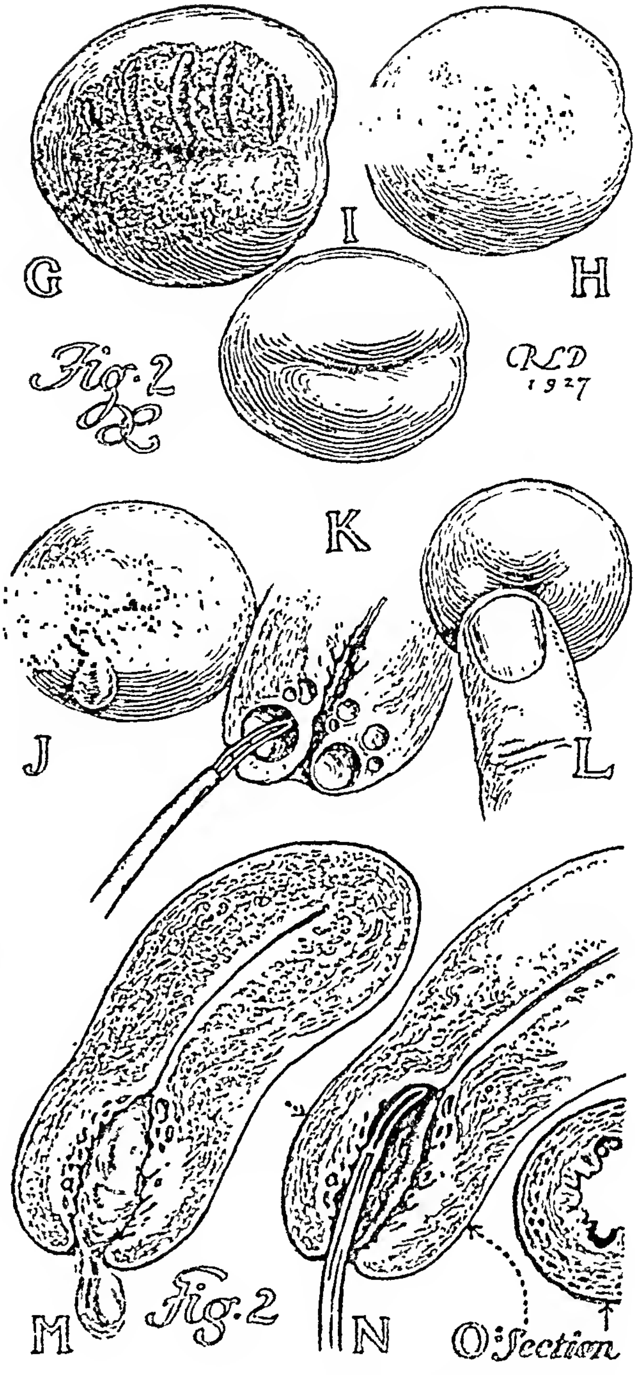
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Fig. 1.—Cautery Handle and Nasal Electrodes. The narrow loop (*A* or *B*¹) suffices for striping and punctate treatment, for opening cysts and removing polyps; also for reaching to bottom of urethral glands to sterilize them, or to split them wide open. Spirals (*C*¹, *C*², and *D*) are of some value deep in the cervical canal, but, used too actively, might cause stricture. The porcelain cone (*D*) prevents clogging with burnt mucus. The thin blade (*E*) can be applied flat on lesser inflammations. In sterilization, (*B*² or *F*) may be used, in lieu of spirals, to produce stricture at cornu.

Fig. 2.—Cautery Treatment of Gonorrheal Cervicitis. (*G*) Granular porous cervix treated on anterior lip by parallel cautery stripes close together. The heat sterilizes intermediate areas, and these unburned regions prevent stricture; (*H*) remaining areas calling for second or third cauterization; (*I*) healthy surface with everted lips rolled in sufficiently to preclude need for repair; (*J*) cystic disease, one cyst cauterized, with contents extruded; (*K*) section, with wire penetrating cyst;

fore healing as sometimes happens when the cutting spear is employed. Cysts which the finger feels and the eye cannot find may be made visible by finger tip pressure, quick withdrawal of the digit and a stab at the blanched spot which remains in sight just long enough to reach it with the point. Only for deep punctures need the wire be white hot in order to keep on penetrating, but in vascular and varicose cervices the platinum should carry as little heat as possible, unless decongestion by bleeding is desired.

The character of relief afforded by opening cysts is witnessed by the return of patients, months or years later, with cysts in new locations. They come to the office requesting new puncture as they recognize aching from recurrence of tension.

It is to be noted that the radial cautery stripes sometimes produce longitudinally contracting scars that tend to inroll the cervix. This supplements the effect of lessened congestion and edema and the retreat of the columnar epithelium within the internal os.

There is one objection to this procedure besides the cost of the outfit and that is the roast meat smell of burning flesh. I have the window behind me slightly open in order to stick the platinum tip over the sill in case the wire is clogged with tissue or mucus and this is to be burned off. This does away with most of the stench. I usually treat any extensive granular areas on everted cervical lips at one session and the deeper canal at the next session, but both can be handled the first time. Failure to get prompt results within the canal is usually due to insufficient cleansing. The wire is clogged and cooled by masses of mucus, and a defective and deceptive amount of heat is employed.

No after treatment is necessary, but the patient must be warned of the possibility of an unpleasant or irritating discharge for a few days which may require douching or special cleansing.

Crossen (1922, 1925) believes that where there is decided laceration and extensive formation of cysts, resection is preferable to the cautery and says that the Hunner treatment must be repeated every ten days or two weeks, sometimes over a period of several months. This repeated cauterization and the length of time required "constitute a decided objection." "The subject of linear cauterization has been presented most helpfully by Dickinson. This usually disturbs the patient very little and can be carried out as ordinary office work. It presents the advantages of the more severe Hunner cautery treatment."

Gellhorn (1923) gives the Dickinson method at length, and says

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(*L*) palpation of deep cyst; (*M*) obstinate disease, deep in canal. Mucus must be dried out exactly (and a very narrow external os stretched) in order to enable the cautery wire (*N*) to run two or three grooves down the cervical canal, from top to bottom through its rough gristly lining (*O*). In (*N*) one gutter is burned, and the second begun.

undue contraction of tender scars has not resulted in his own practice.

Curtis, after working nine years on leucorrhea, gives his cures as follows: with radium, two applications, 90 per cent; with cautery, 50 per cent; with Sturmdorf, 50 per cent.

In the following reports, unless the Paquelin is specified, the electric heated platinum wire is understood to have been employed.

Gibson (1923) after making a clear classification of cervix inflammation, says that the infected nonlacerated cervix is the type "in which the cautery treatment has its most brilliant success," the most common etiologic factor being, "of course, the gonococcus." "The congested lacerated cervix," he says, "can generally be saved from operation by support and cauterization. In the infected lacerated cervix, cautery punctures of cysts and linear cauterization to cause inversion and support will do wonders."

C. H. Davis (1925) reports on 106 patients treated with the cautery in the office and 31 under ether in the hospital. Every case was improved. Six weeks was the healing time and a third application was infrequently needed. "We rarely advise operation unless other conditions demand it."

Shutter (1925) burns out the urethral glands with the platinum wire for chronic gonorrhea and does this to the cervix also. For three years he has studied hospitalized prostitutes and has determined a decrease in the number of hospital days required when cautery is used. He has not resorted to the cautery where the tubes were involved or acute gonorrhea present or close to the period. There was only one recurrence among 18 cases followed up. Cervical stenosis or obstructive dysmenorrhea has not been seen in his 83 cases. He makes an important observation in stating that "in institutions it affords a means of rapidly sterilizing the secretion in the irresponsible patient, regardless of the degree of her cooperation." "The gonococcus is destroyed in the tissues by the local elevation of temperature." In 1926 he reports on 350 cases.

Fulkerson (1926) labels the cautery standard treatment at the Cornell Clinic in his report on 591 cases, with 65 per cent cure, 90 per cent of clinical cure and one stenosis of the cervix.

Matthews (1926) reports on 226 cauteries in the office with 80 per cent of cures and 20 per cent improved, followed by many pregnancies and labors without complications due to the cautery treatment. He holds that with patients needing hospital operation, the Sturmdorf procedure is better than the cautery.

Polak (1927) says that his histologic studies show extension of the effect of heat 2 to 3 mm. beyond the slough. Matthews, in the same discussion, calls this distance 3 to 5 mm. Corbus (1927) shows that most of the bacteria, particularly the gonococcus, will be killed at this distance. McGlinn asserts that the cautery of Dickinson does not cure all gonorrheas but will, probably, cure the majority.

As to other methods of applying heat to these cervical surfaces, Abrams (1925) simply heats a forceps tip in the flame and applies it for 2 or 3 seconds to produce a slough. Tousey (1926) advocates electrodessication, but this involves the use of an electrode against the body from which a patient may occasionally pull away and also a noisy sputter of which she is afraid.

I have carefully compared fulguration with the simple incandescent wire. The five to ten times greater cost of the installation and the sputtering noise of the application are definite objections as well as the use of the external metal electrode. Furniss, who is very expert in fulguration and has also used the simple nasal cautery on cervix and meatus, is perhaps the most competent witness both as gynecologist and urologist. He has stated that fulguration has no advantages over the simple incandescent wire.

Thompson (1926) located cysts by transillumination with a Carroll antrum illuminator. When used outside the cervix it is hooded. A urethrascope may be used inside the cervix. The cysts show up as translucent areas.

Norris and Mikelberg (1923), studying 100 infants and young girls suffering from vulvovaginitis, report that all cases should be considered gonococcal unless proved otherwise, in view of their 60 per cent positive findings. "The cervix is infected in nearly all chronic cases. Failure to cure the infection in this area is the cause of the majority of recurrences. The infection rarely extends above the cervix."

A large part of their success is attributed to examination with a large Kelly cystoscope equipped with a cold lamp as routine. I draw attention to one weighty consideration. The use of the cautery in children abbreviates the treatment of this form of gonorrhea more than any one measure, since as a rule only one or two applications are required to wipe out the focus responsible for the trouble.

I have urged the importance of the cautery in the endocervicitis of the virgin (the actual virgin with the tiny hymen opening) because the treatment can be applied through a virgin speculum or a Kelly cystoscope and calls for only two or three visits. These conditions in virgins are seen in grown women after an infantile vulvovaginitis or in women whose hypertrophic vulvas (or admissions) show prolonged autoeroticism. In the latter case, it is particularly desirable that an abbreviated method of treatment should be employed.

CONCLUSIONS

1. Since gonorrhea has not yielded in any degree as have syphilis and most world scourges and infections, and since the cure is a matter of local treatment, gynecology should be actively concerned in a concerted attack on a malady which never confers immunity and which is accused of one-fifth of early blindness, most of the vulvitis of children, half the sterilities and half the pelvic disabilities of women.
2. Such attack should focus first on women because, as compared with conditions in men, the numbers to be dealt with are said to be less by two-thirds or four-fifths; the lesions are more accessible; the diagnosis is less difficult; prostitutes, open and clandestine, are largely of this sex; hospitalization is more practicable; and there is available for women a promising treatment involving minimum repetition or detention.
3. The direction for such attack is shown by the special circumstances surrounding this trouble. These are that the chief center is the big city; the chief characteristic is chronicity; the chief seat is the cervix; the chief cure is the cautery; the cardinal simplicity is this tiny platinum wire effective in office practice.
4. Follow-up, wherever enforceable, as among prostitutes, during the short period inscription is likely to last, should be pushed to the limit to study these cautery claims. Organization should be effected to hunt down every accessible focus.

5. Education of public opinion is, in part, a responsibility of medicine. We can help to define school instruction that will warn against the extent and duration of the penalties for exposure. Examination before marriage may have to become a custom before a law would be enforceable.

REFERENCES

(1) *Abrams, Samuel Frank:* A simple method of cauterization of the cervix, Jour. Am. Med. Assn., 1925, lxxxv, 418. (2) *Baermann, Gustav:* Die Gonorrhoe der Prostituierten. Ztsch., f. Bekämpfung der Geschlechtskrankheiten, 1903-04, p. 100ff, 133ff. (3) *Bettmann, S.:* Die aertzliche Ueberwachung der Prostituierten, 1905, and Handbuch der Sozialen Medizin, vii. (4) *Cashman, B. Z.:* Cautery Treatment of Chronic Cervicitis, With Histological Studies, AM. JOUR. OBST. AND GYNEC., 1924, viii, 628. (5) *Charpy, Adrien:* Organization genitale exterieure chez les prostituées, 1910, Ann. de dermat. et de syph., p. 1870. (6) *Corbus, B. C. and O'Connor, V. J.:* Diathermy in Treatment of Gonorrheal Endocervicitis, Jour. Am. Med. Assn., 1926, lxxxvii, 1816. (7) *Crossen, H. S.:* Operative Gynecology, ed. 3, St. Louis, 1925, C. V. Mosby Company, p. 247. (8) *Curtis, A. H.:* Combined Bacteriologic and Histologic Study of the Endometrium in Health and Disease, Surg. Gynec. and Obst., 1918, xxvi, 178. (9) *Curtis, A. H.:* Pathology and Treatment of Chronic Leucorrhea, Surg., Gynec. and Obst., 1923, xxxvii, 657. (10) *Curtis, A. H.:* Use of Sounds, in his comments on paper by Palmer Findley, Tr. Am. Gyn. Soc., 1919, p. 298. (11) *Davis, C. H.:* Cautery Treatment of Chronic Endocervicitis, Jour. Am. Med. Assn., 1926, lxxxvi, 1763. (12) *Davis, C. H.:* Chronic Endocervicitis, its Clinical Importance and Results from Treatment with Electric Cautery, Surg., Gynec. and Obst., 1925, xl, 568. (13) *Dickinson, R. L.:* Hypertrophies of the Labia Minora and Their Significance, Tr. Am. Gynec. Soc., 1902, p. 225. (14) *Dickinson, R. L.:* Endocervicitis and Eversion and the Nasal Cautery, AM. JOUR. OBST. AND GYNEC., 1921-22, ii, 600. (15) *Dickinson, R. L.:* Practical Lectures, Office Gynecology, Hoeber, 1923-24, p. 80-115. (16) *Dickinson, R. L.:* Meatus Infection, Am. Jour. Obst., 1911. (17) *Dickinson, R. L.:* Urethral Labia, Am. Med., 1904, vii, 347. (18) *Flexner, A.:* Prostitution in Europe, Bureau Social Hygiene, 1925, Century Co. (19) *Findley, Palmer:* Work of the Detention Home for Women, Tr. Am. Gyn. Soc., 1919. (20) *Fulkerson, L. L.:* Endocervicitis, a Clinical Study of 1039 Cases, AM. JOUR. OBST. AND GYNEC., 1926, xii, 375. (21) *Gellhorn, G.:* Non-Operative Treatment in Gynecology, New York, 1923, Appleton, p. 287. (22) *Gibson, G.:* Treatment of Certain Conditions of Cervix Uteri, New York State Med. Jour., 1923, xxiii, 109. (23) *Grotjahn, A.:* Die Hygiene der Menschlichen Fortpflanzung, Berlin, 1926, Urban. (24) *Haustein, H.:* Geschlechtskrankheiten und Prostitution, Handbuch der Sozial Hygiene, 1926, iii, 643. (25) *Hunner, Guy L.:* Jour. Am. Med. Assn., 1906, xl, 191. (26) *Jadassohn, J.:* Syphilis: Is Salversan a Success? Proceedings, International Congress Sex Research, Berlin, 1926. (27) *Jadassohn, J.:* Bericht über eine zum studie der Prostitution unternommen Reise, Deutsch Vierteljahrsschrift fur Gesundheitzpflege 26, 1894. (28) *Matthews, H. B.:* Electric Cautery Versus Sturmdorf Operation, Jour. Am. Med. Assn., 1926, 1802. (29) *Matthews, H. B.:* Study of Chronic Endocervicitis, Surg., Gynec. Obst., 1921, xxxii, 249. (30) *Menge, Karl:* Die Gonorrhoe des Weibes, Handbuch der Geschlechtskrankheiten, 1910, ii, 323-517. (31) *Norris, C. C.:* Gonorrhea in Women, Philadelphia, 1913, W. B. Saunders Company. (32) *Norris, C. C.:* Gonorrhea in Women: Some Interesting Points in Diagnosis and Treatment, L. I. Med. Jour., 1914, 201. (33) *Norris, C. C., and Mickelberg:* Gonorrheal Infection in Lower Genital Tract of Infants and Young Girls, 100 Cases, Therap. Gaz., 1923. (34) *Polak J. O.:* Comment on Cauterization of Cervix Before Hysterectomy, Tr. Am. Gynec. Soc., 1926, p. 198. (35) *Schüller, K. H. M.:* Festschrift für B. Schultze, 1883, iv, 16. (36) *Shutter, H. W.:* Treatment of Chronic Gonorrhea in Women With the Electric Cautery, Surg., Gynec. and Obst., 1925, xl, 572. (37) *Skene, A. J. C.:* Diseases of Women and Children, Am. Jour. Obst., 1880, xiii. (38) *Skene, A. J. C.:* Diseases of Women, ed. 3, New York, 1898, Appleton, p. 664. (39) *Thompson, L. R.:* Transillumination of Cervix of Uterus, Jour. Am. Med. Assn., 1926, lxxxvi, 1437. (40) *Tousey, S.:* Method of Surgical Diathermy or Endothermy (Rendering It Painless Without Anesthetics), Jour. Am. Med. Assn., 1926, lxxxvi, 527.

THE SURGICAL TREATMENT OF IMPERFORATE ANUS, WITH THE REPORT OF A CASE

By Leo P. Bell, M.D., Woodland, Calif.

(From the Department of Surgery, Woodland Clinic, Woodland, California)

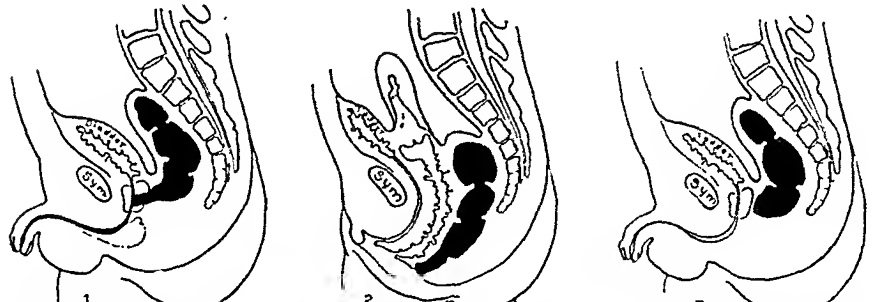
IMPERFORATE anus has been recognized since the seventh century. Paulus of Aegina first described a successful operation for its relief. A bistoury was passed through the perineum, the opening being later dilated by bougies. This type of procedure was practiced with very little variation until the time of Amussat. In 1835 he recommended proctoplasty with careful dissection of the parts and fixation of the rectum to the proper anal site. In 1844 the French advised inguinal colostomy when perineal section failed. Bell, of England, in 1787, was the first to adopt the rational procedure of dissecting through the perineum and searching for the rectal ampulla. The first successful operation in the United States was performed by Campbell in 1790.

Congenital defects of the anus and rectum, although quite rare, may be found in the professional practice of any physician or surgeon. According to statistics the ratio of occurrence is approximately one to ten thousand and, as a rule, it is more frequent in males than in females. The rate of occurrence, however, is probably higher, since many infants die with rectal imperfections and obstruction without the condition being recognized, or reported if recognized. The most frequent anal defects are malformations with abnormal opening, such as vaginal or urethral communications. The others are very rare. (Fig. 1.)

Bodenhamer, in 1860, wrote the first comprehensive chapter on the classification and treatment of the various abnormalities. In 1887 Cupps reported one hundred operative cases. Since that time numerous cases have been reported, both singly and in groups. The choice of operative procedure and end-results have varied markedly. The factors influencing these results are: the type of variation, physical condition of the patient, method of operation, and operative experience of the surgeon.

Owing to the rarity of these conditions, few surgeons are acquainted with the embryology of their formation or with the possibilities of variation.

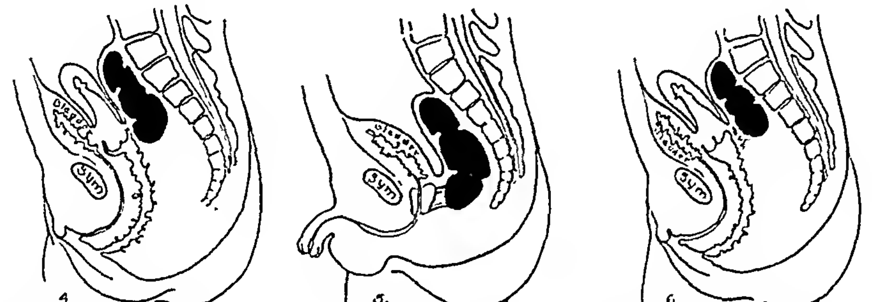
A study of the factors involved will make it apparent that an imperforate anus may mean anything from the mere persistence of a cloacal membrane to a total lack of development of the rectal or the



1. Rectum opens into prostatic urethra

2. Rectum opens into vulva

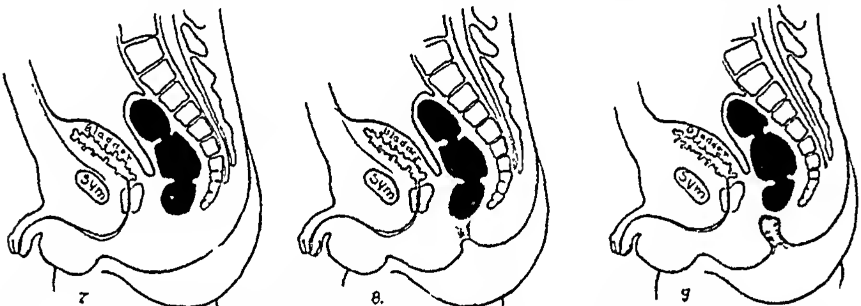
3. Rectum ending blindly at back of prostate



4 Rectum ending blindly at posterior fornix of vagina

5. Rectum attached to prostate by fibrous cord

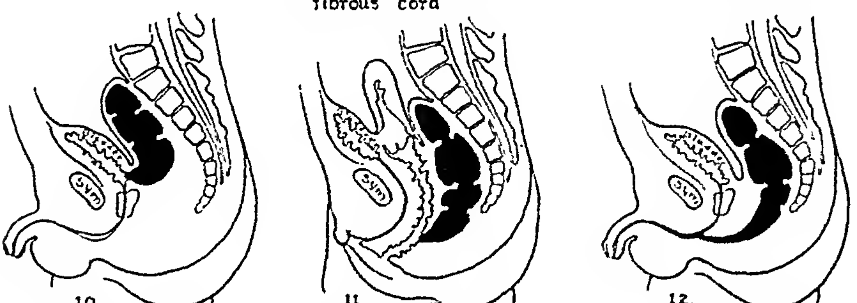
6 Rectum attached to posterior vaginal vault by fibrous cord



7 Absence of proctodaeum

8. Proctodaeum and rectum not communicating but attached to each other by fibrous cord

9 Proctodaeum and rectum separated by a thin membrane



10. Rectum opens into bladder

11 Rectum opens into vagina

12. Rectums opens into penile urethra

Fig. 1.—Possible variations of rectal abnormalities.

anal part of the canal. Moreover, the condition may be still further complicated by the presence of sinuses leading to the bladder, urethra, or genital passages. It will be readily seen that individual cases may present wide variations.

From the embryologic point of view all cases fall into one of the following three classes:

1. The hind gut is normal, but the canal is defective or absent.
2. The hind gut is imperfect in development and may or may not communicate with the genitourinary passages, but does not communicate with the anal canal, though the latter is normal.
3. Both the hind gut and the anal canal are defective.

The diagnosis is generally made through the discovery of the absence of bowel movements, vomiting and distention of the abdomen, straining at micturition, and voiding of fecal material when the rectum communicates with the urethra or bladder. When the rectum communicates with the vagina or when the lower extremity is narrowed a careful examination may be made with a probe or child's cystoscope.

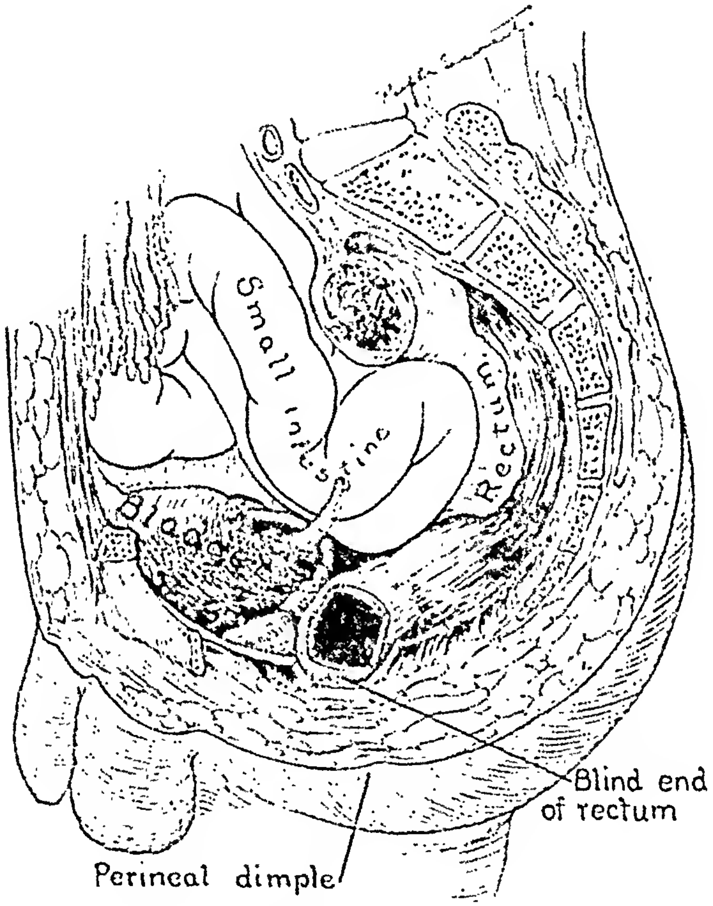


Fig. 2.—Position of the blind end of rectum before an attempt was made to pull it down into the perineum.

Too often the child comes under the notice of the surgeon in a very serious condition. Avoidance of delay in instituting operative intervention is imperative. The operative procedure varies with the abnormalities encountered.

The present accepted procedure is by the perineal approach, endeavoring to keep between the sphincter muscles. Light ether or local anesthetic is employed, with the child in extreme lithotomy position, and a search of fifteen to twenty minutes is made for the blind end of the gut. If it is not discovered during this time, a left inguinal colostomy of the Mikulicz type should be done and the opening made immediately.

At a later date the rectum can be isolated and fixed in the perineum and the colostomy closed when the physical condition permits. It is advisable to inject the lower end of the bowel with lipiodol to demonstrate all fistulas before closure of the colostomy and restoration of artificial anus is contemplated. Often after a colostomy has been established fistulas into the bladder and urethra may close spontaneously. All symptoms of fecal drainage are promptly relieved.

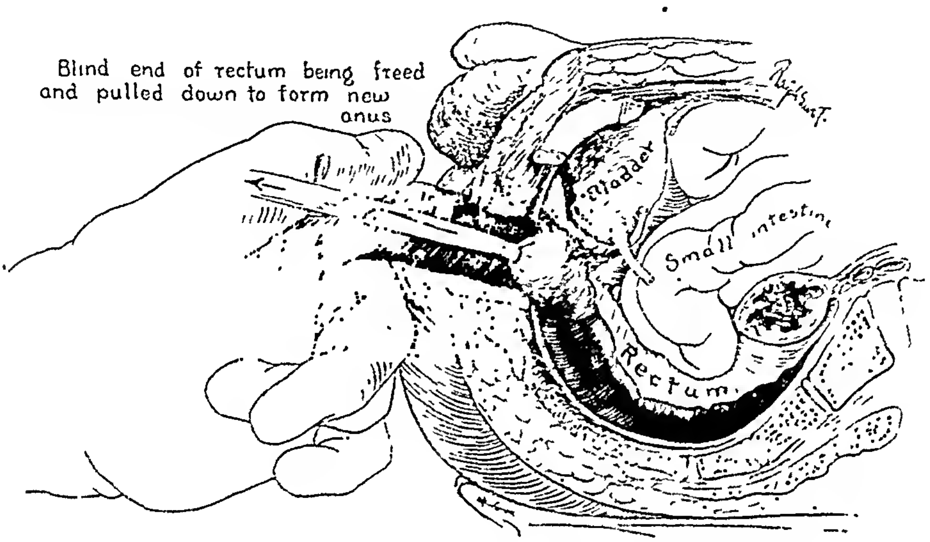

Blind end of rectum being freed and pulled down to form new anus
Bladder
Small intestine
Rectum

Fig. 3.—Blunt dissection of lower end of rectum preparatory to placing it in position between sphincter muscles in perineum.

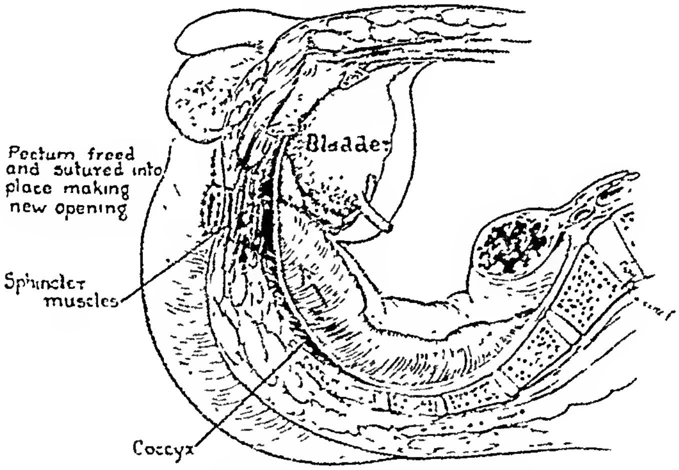

Rectum freed and sutured into place making new opening
Bladder
Sphincter muscles
Coccyx

Fig. 4.—Relationship of the artificially made anus to prostate and base of bladder. Position in the perineum.

The mortality according to Cupps was 50 per cent. As reported by Brenner in 1915, it was approximately 25 per cent. Since the advent of local anesthesia and the two-stage operations, it has been reduced still further.

It must be remembered that autopsy reports show many other deformities existing coincidentally, such as stricture of the esophagus, stricture of the pylorus, multiple strictures of the small and large bowel, absence of the large bowel, absence of one or both kidneys, and absence of gall bladder and common ducts.

Postmortem examinations should be sought on all operative deaths and explanations given to relatives of the variations which prevented a successful termination to convalescence following operative intervention.

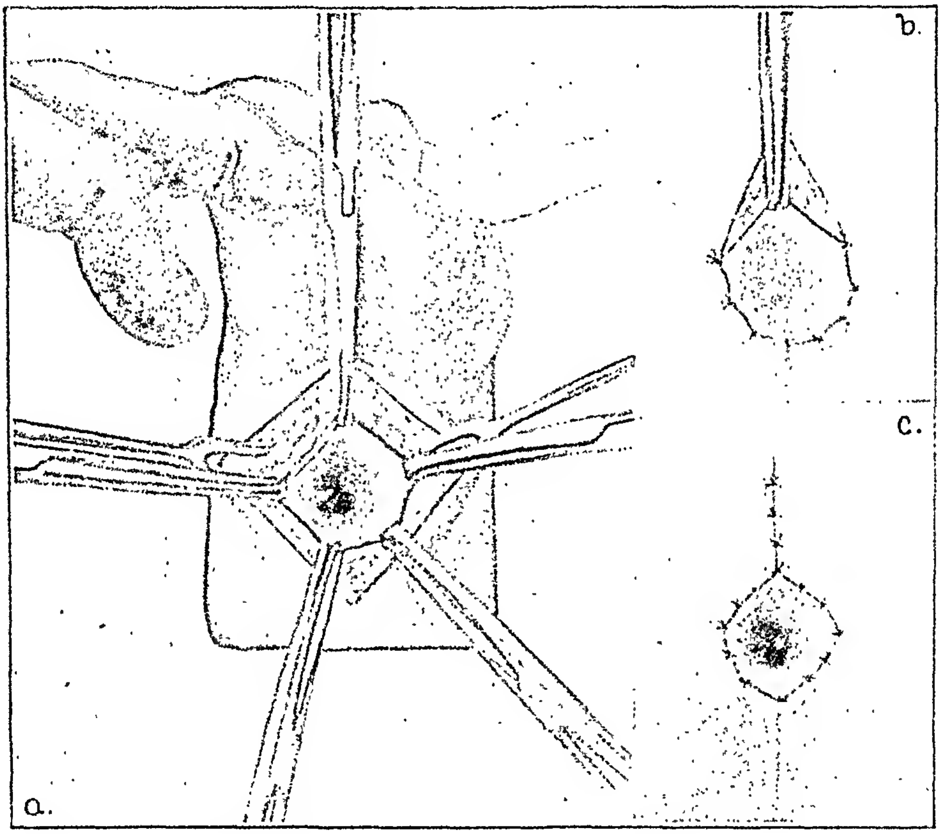


Fig. 5.—Approximation of the rectal mucosa to the skin edge. Interrupted dermal sutures used throughout.

The postoperative care is most important, since there is a tendency to stricture of the newly-formed rectum in most cases. This must be dealt with by frequent dilatation of the rectum, by bougie or finger, for a period of one year or more following operation.

The diet of the infant must be carefully watched since diarrhea, bronchitis, constipation, and malnutrition must be avoided. According to Keith many infants die following operation from malnutrition, constipation, and diarrhea.

SUMMARY OF CASE

Baby C., a white male, was operated upon April 20, 1926. There was no history of abnormalities in family of either father or mother. Baby was brought to the hospital approximately twenty-four hours after birth, the family physician having discovered that the rectum was absent.

Perineal approach was made in midline, attempting to keep in between sphincter muscles. The rectum was found to be one and one-half inches from the surface of the skin. By blunt dissection, the rectum was brought down, opened, and sutured to the skin surface as shown in the accompanying drawings.

The baby's convalescence was uneventful except that leakage of urine through the perineum was encountered the day following operation. Accordingly, about ten days after the first operation, a catheter was introduced through the urethra and followed down and guided past a fistulous point which was located in the membranous urethra. The catheter was kept in the urethra for about ten days. After its removal no leakage was discovered and convalescence has been without incident, the child voiding freely and defecating with apparent control.

It is assumed that the rectum communicated with the posterior urethra, or that an injury was done the urethra by needle puncture, since the sinus tract was very small. For this reason it is advisable to keep a catheter or sound in the urethra during the operation.

Since the operation, the child has been gaining in weight, but not so rapidly as a normal child. He has had several attacks of diarrhea and colds. Otherwise his progress has been entirely normal and his bowel movements are nearly normal at the present time. The child is now about eleven months old.

WOODLAND CLINIC.

Lenormant, C., and Hartman-Keppel, G.: Accidents of Tubal Pregnancy. Gynécologie et Obstétrique, 1923, vii, 273.

The authors add a new series of forty-eight cases to an older group reported in 1915. Each case is briefly reported. In the combined series of eighty-four cases with hemorrhages of various types there was a mortality of 10.7 per cent. Most of these cases reached the hospital in a grave condition. ADAIR.

Wislocki, G. B., and Guttmacher, A. F.: Spontaneous Peristalsis of the Excised Whole Uterus and Fallopian Tubes of the Sow, with Reference to the Ovulation Cycle. Johns Hopkins Hospital Bulletin, 1924, xxxv, 246.

The whole internal genitalia of the sow were observed in a bath of warm oxygenated Locke's solution. Spontaneous peristalsis and antiperistalsis were observed in both fallopian tubes and in the uterus. The muscular activity of the tubes and uterus shows cyclic variations coincident with the ovulation cycle. This activity suggests a possible mechanism for the transportation of ova. C. O. MALAND.

THE TREATMENT OF CONTRACTION RING DYSTOCIA WITH ADRENALIN*

BY M. PIERCE RUCKER, M.D., RICHMOND, VA.

WERE it customary to print facts in black and fancy in red ink, medical literature would be of a brighter hue, and I fear my present effort would be especially lurid. It is necessary, however, to have some sort of a framework for the fact one wishes to present, and the color of the frame is unimportant, if it does not distract from the fact. My difficulty is especially great in the present case, because I am presenting for a condition about which we know little, a remedy about which we know much that is contradictory.

That under certain circumstances a band-like contraction of the uterus forms and interferes with delivery, there is little doubt. Some authors prefer to call this Bandl's ring,[1] some add the word retraction, and some prefer the term contraction ring. The ring, called by whatever name you choose, is located between the lower, noncontractile portion and the upper contractile part of the uterus. In reference to the fetus, it is located either in front of the presenting part or else in front of some prominent fetal part. A favorite location is about the child's neck in head presentations.[2] The irregularities of the fetus thus fix the contraction ring, and the ring can neither ascend nor the lower uterine segment become distended or stretched. This makes a distinct difference clinically between the contraction ring that obstructs labor and the retraction ring that becomes so marked when there is obstruction to labor from extrinsic causes. Clifford White[3] shows this well in tabular form.

Paul Harper,[4] who has written more upon this subject than any other American, calls the ring a contraction ring when the upper uterine segment is not tonically contracted, and a retraction ring when the upper portion of the uterus has no period of relaxation. He speaks of both contraction and retraction rings as obstructing labor. It is hard to see how a contraction ring that obstructs labor can at the same time be a retraction ring and progressively retract, so long as it stays contracted.

The etiology of the condition is obscure. The great majority of cases are associated with early rupture of the membranes, but there are enough exceptions to show that this is not a fundamental factor. The same can be said of intrauterine manipulations and the use of oxytocics. Harper[5] is of the opinion that the ring develops as the result of faulty innervation of the uterus or else an abnormal irritability of the uterus. He disposes of the former because he has seen cases of ring dystocia that showed no evidence of the condition in former or subsequent labors. In support of the latter idea, he says that the condition is very often found in neurotic individuals.

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*Read before the Junior Clinical Club, Richmond, Va., March 21, 1927.

Treatment resolves itself into some form of operative delivery plus the overcoming or relaxing the contraction ring. Expectancy has no place in the treatment. White[2] cites Budin's case in which after thirty-six hours the ring was found to be as tight as it was at first. Various drugs, morphine, chloral, and hyoscine have been tried in hopes of relaxing the ring and have failed. Amyl nitrite has been effectual in one reported case. Hot baths are said to have caused relaxation in one of Budin's cases. Attempts at forceful delivery with

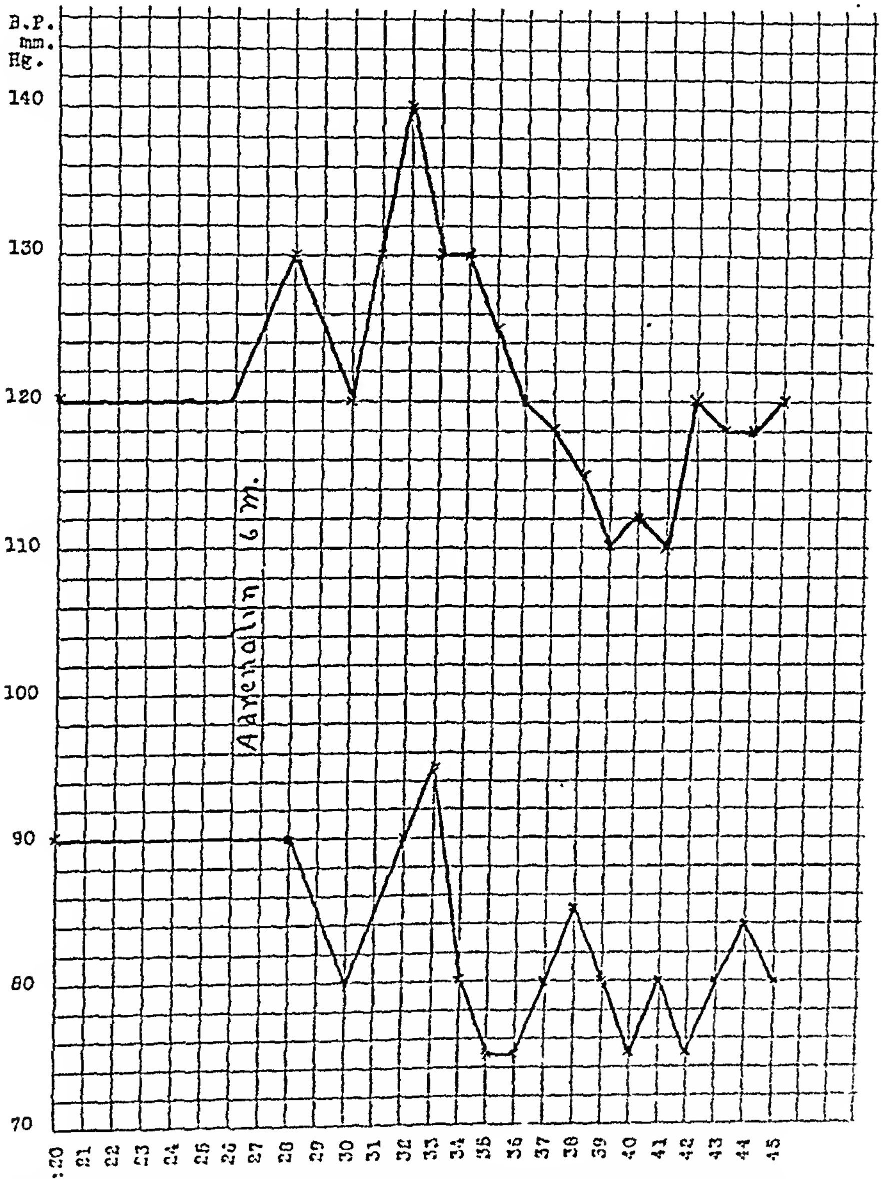

Fig. 1.—Blood pressure curve following the hypodermic injection of 0.5 c.c. of adrenalin in Case 2 one month after delivery. Each square vertically represents 2 mm. of Hg. pressure, and longitudinally one minute in time.

forceps without first relaxing the ring have often resulted in rupture of the uterus. Willett[7] recommends applying forceps and hanging a 6½ pound weight to them. Hicks[8] cut off the head below the ring and delivered the body by internal version. Lochrane[9] advises cesarean section after decapitation or craniotomy and decapitation in case of extreme pelvic contraction. White[10] says that there is no satisfactory treatment except cesarean section, and even then it is often necessary to cut through the ring in order to deliver the child. Harper[4] on the other hand thinks that the ring can be relaxed with deep ether anesthesia, and then the delivery effected by appropriate means from below. Hicks[11] is of the opinion that once the ring is formed around the neck of the fetus it will grip it firmly until the patient is almost at the point of death.

My second difficulty, i.e., the contradictory views of the action of adrenalin upon uterine contractions is shown in Table I.[12]

TABLE I*

ANIMAL	NONPREGNANT UTERUS	PREGNANT UTERUS	INVESTIGATOR
Rat	–	–	Gunn and Gunn
Guinea pig	–	–	Gunn and Gunn
Guinea pig		– +	Sugimotol (intravenous +)
Guinea pig		– +	Flury (excised – *in situ* +)
Cat	–	+	Cushny Dale Kehrer
Rabbit	+	+	Langley and Anderson
Ferret	+		Gunn and Gunn
Dog	+	+	Gunn and Gunn Kurdinowski
Monkey	+		Dale
Human (excised)		+	Gunn

*Inhibitor – Motor +

That the generally accepted view that adrenalin causes an increase in uterine contractions, is not true for the human intact uterus can be shown by hysterographic methods. In most cases a hypodermic injection of five minims of a 1/1000 solution of adrenalin causes a cessation of uterine contractions that can be shown graphically, and a relaxation of Bandl's ring that can be felt with the hand in the uterus. In no case have I obtained a motor effect. The cases in which there was no relaxation, showed no effect at all, and are probably to be explained by a vasoconstriction at the point of injection that delayed absorption. This observation of the effect of adrenalin upon the human uterus leads me to advocate its use to relax contraction rings in discussing Dr. Pride's[13] paper at the Dallas meeting of the Southern Medical Association. Dr. Garber[14] who was chairman of the obstetric section at the time, writes me that he has since used adrenalin in the presence of contraction rings that did not yield to morphine and deep anesthesia in eight cases and had a response in all but one. My own experience is limited to the two following cases.

CASE 1.—A 17 year old primipara, was seen in consultation at the Memorial Hospital March 8, 1926. Her pains began March 7 at 1 A.M. and the cervix was fully dilated in 11½ hours. For the next 20 hours she had severe pains but there was no further progress. Her pains were so severe that her physician had been giving her nitrous oxide-oxygen for several hours. At 8:30 A.M. (March 8) under ether anesthesia, he did an episiotomy and attempted to do a version. The amniotic sac was ruptured at 9:31 A.M. and a thick band was found tightly about the baby's neck. All attempts at delivery were stopped, but the anesthetic was continued. I saw the patient within ten minutes after this. During the time I was washing up the patient was completely relaxed with ether. Vaginal examination showed head in midpelvis in L.O.P. position. The flaccid cervix was loosely about the head. Around the neck there was a thick band that prevented my getting even a finger any higher in the birth canal. The anesthesia was continued as before and five minims of a 1-1000 solution of adrenalin were given hypodermically. Within a few minutes the contraction ring disappeared and I was able to do an easy version and extraction. The child was delivered at 10:06 A.M. and the afterbirth as soon as the episiotomy wound was repaired. The baby, a girl, weighed 3011 gm. and was 46 cm. long. Both mother and baby left the hospital in good condition. The mother had a temperature of 105° on the eleventh day and of 102° on the twelfth day. Otherwise the puerperium was normal. The baby was doing nicely on March 30, 1926.

CASE 2.—A 31 year old secundigravida came under my care December 17, 1926. Her last menses began on May first. Her pelvis was a little under normal, the diagonal conjugate being 12.5 cm. Her first child had been delivered with forceps. Otherwise her history and physical examination, including blood Wassermann, were negative. On February 3 the bag of waters ruptured, but the patient had no pain until 10 o'clock the next night. At 3:15 A.M. February 5 the cervix was found to be fully dilated, and the patient was having hard pains. The head was in L.O.A. position. She was given sacral analgesia. Forceps were applied and an unexpectedly difficult extraction was done. Two loops of cord were found tightly wrapped around the neck. When the cord was cut between clamps and unwrapped, I was greatly surprised to find that I was still unable to deliver the shoulders or even rotate the body. Traction on the head combined with pressure on the fundus was entirely ineffectual. The patient was conscious and cooperated well with her abdominal muscles, but even at the acme of the combined efforts of the patient, the nurse and the doctor, the head appeared to be drawn upward against the perineum. It now occurred to me that there might be a contraction ring. The patient was accordingly given five minims of 1-1000 solution of adrenalin. Extraction then was surprisingly easy. The baby, a still-born male, weighed 4024 gm. and measured 54 cm. in length. The placenta was expressed in five minutes to stop bleeding. The puerperium was uneventful and afebrile.

There now remains the fascinating exercise of attempting to explain this effect of adrenalin. Marshall[15] in his *Physiology of Reproduction* states that there is a slight increase in the size of the adrenals and a slight increase in the load of adrenalin during pregnancy. Just what is the purpose of such a change is not stated. The uterus is capable of undergoing contraction even when separated entirely from the body and the experiments of Helms,[16] Kurdinowski,[17] Sir James Y. Simpson[18] and others[19] upon animals and the clinical observations upon patients with spinal cord injuries[20] would indicate that the uterus is capable of expelling its contents up to the end of the first stage of labor independently of the nervous system. Under ordinary circumstances, however, it is under control of the automatic nervous system.

The involuntary nervous system, be it remembered, is divided into two parts, the sympathetic and the parasympathetic or bulbosacral.

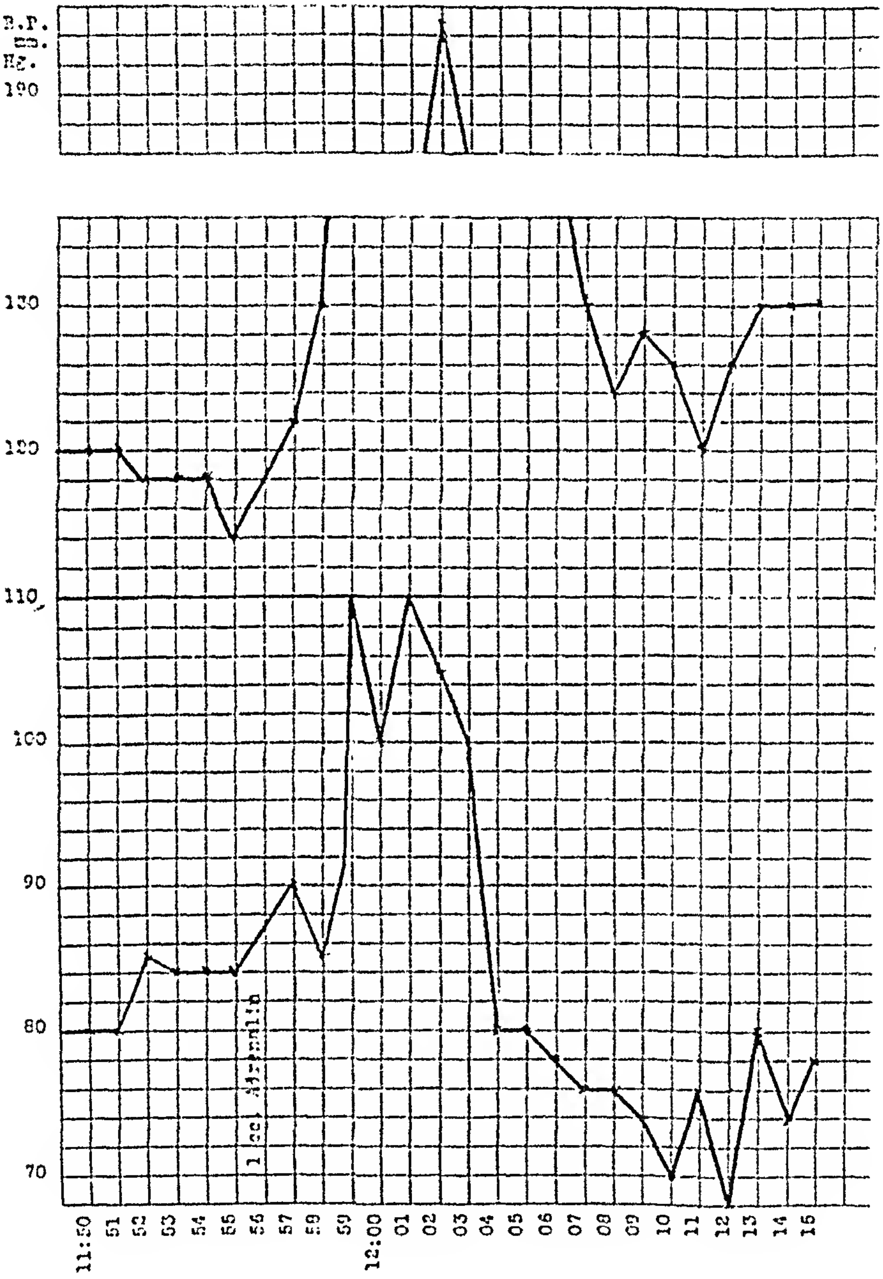

Fig. 2.—A typical sympathicotonic reaction to 1 c.c. of adrenalin, obtained the first day postpartum. This patient had postpartum hemorrhages after her two previous deliveries, and after this delivery the flow was much freer than in the average case.

Where these two systems enervate the same organ their actions are sharply contrasted.[21] The pupillary reactions and the heart rate are well-known examples of such antagonistic action. Stimulation of the cervical sympathetic causes a dilation of the pupil, whereas stimulation of the oculomotor fibers causes a contraction. A stimulation of the cardiac nerves (sympathetic) causes acceleration of the heart and *stimulation of the vagus (parasympathetic)* a slowing or even stoppage of the heart. Unfortunately the action of these two systems upon the uterus has not been worked out. There is some pharmacologic evidence that the sympathetic system is an uterine inhibitor. In a recent work upon the action of ergotamine, Vazeille[22] has shown that it has a direct inhibitory action upon the sympathetic. The action of adrenalin is considered to be identical to that of stimulation of the sympathetic except that it is slower and more prolonged. Cannon[23] says that disturbances in the realm of the sympathetic, although initiated by nervous discharge, are automatically augmented and prolonged through chemical effects of the *adrenal secretion.*

Vignes[24] in discussing the variations in the action of anesthetics has long stressed the clinical differences in uteri. In his recent *L'Année Obstétricale*[25] he reviews the work of Peyser, Vowinckel, Seitz and Louros who show that during pregnancy there is an abnormal excitability of automatic nervous systems, sometimes showing as a vagotonia and sometimes as a sympathicotonia. This is shown clinically by the palpitations, respiratory arrythmias, digestive disturbances, dermatographias and action of the sudorific glands of the skin. It can also be shown by the differences in response to the hypodermic injection of adrenalin as shown by the blood pressure curve. Three types of response are described. In a normal subject the elevation in arterial tension and subsequent fall describes a parabola. With the sympathicotonic the pressure describes a steeple-like curve. With the vagotonics the pressure ascends as in the normal patient and the descent is also similar but the descent continues below the base line and there is a secondary rise to the initial level. In other words there is a second parabola below the base line. In applying the adrenalin test hypodermically one must remember that sometimes the local vasoconstriction and the consequent slow absorption of the adrenalin may entirely vitiate the test. In such case, these investigators have used intravenous injection although they recognize that such a procedure is not entirely free from danger. In pregnant women Louros has never seen a normal response to adrenalin and Peyser seldom obtained a normal response. In this connection it is interesting to note that my last patient showed a vagotonic response to adrenalin in her puerperium.

In the light of this work may it not be that the contraction ring, which Harper thinks is due to an abnormal irritability of the uterus, is the expression of an abnormal sensitiveness of the parasympathetic system. If such be the case the exhibition of adrenalin would be physiologically and pharmacologically logical.

REFERENCES

(1) *Michael, William A.:* AM. JOUR. OBST. AND GYNEC., 1925, x, 111. (2) *White, Clifford:* Proc. Roy. Soc. Med., London, 1912-13, vi, Obst. & Gynec. Sect., 70. (3) *White, Clifford:* Brit. Med. Jour., 1916, ii, 752. (4) *Harper, Paul T.:* Surg. Gynec. and Obst., 1922, xxxv, 198. *Harper, Paul T.:* Am. Jour. Obst., 1913, lxviii, 640. (6) *Harper, Paul T.:* Am. Jour. Obst., 1916, lxxiii, 15. (7) *Willet, J. A., and Williamson, Herbert:* Proc. Roy. Soc. Med., London, 1912, v, Obst. and Gynec. Sect. 335. (8) *Hicks, H. T.:* Lancet, 1906, i, 1312. (9) *Lochrane, C. D.:* Brit. Med. Jour., 1920, i, 11. (10) *White, Clifford:* AM. JOUR. OBST. AND GYNEC., 1926, xi, 364. (11) *Hicks, H. T.:* Brit. Med. Jour., 1916, ii, 515. (12) *Rucker, M. Pierce:* Southern Med. Jour., 1925, xviii, 412. (13) *Pride, W. T.:* Southern Med. Jour., 1926, xix, 212. (14) *Garber, James R.:* Private communication. (15) *Marshall, Francis, H. A.:* The Physiology of Reproduction, ed. 2, Longmans, Green and Co., London, 1922, p. 558. (16) *Helme, T. A.:* Rep. Lab. Roy. Coll. Phys., Edinb., 1891, iii, 70. (17) *Kurdinowski, E. M.:* Arch. f. Gynäk., 1904, lxxiii, 425. (18) *Simpson, Sir James Y.:* Selected Obstetrical and Gynecological Works, Edinburgh, Adam and Charles Black, 1871, i, 149. (19) *Keye, J. D.:* Bull., Johns Hopkins Hospital, 1923, xxxiv, 60. (20) *Routh, A.:* Tr. Obst. Soc. Lond., 1898, xxxix, 191. (21) *Fraser, John:* Surg., Gynec., and Obst., 1927, xlix, 289. (22) *Vazeille, A.:* Rev. franç. de Gynéc. et d'Obstét., 1926, xix, 666. (23) *Cannon, Walter B.:* Bodily Changes in Pain, Hunger, Fear and Rage, New York, D. Appleton and Company, 1915, p. 38. (24) *Vignes, H.:* Physiologie obstétricale, Paris, Masson et Cie, 1923, p. 369. (25) *Vignes, H., and Dauphin, J.:* L'Année obstétricale (Travaux de 1924) Paris, Masson et Cie, 1926, p. 16.

MEDICAL ARTS BUILDING.

Unterberger, F.: Normal Delivery After Tubal Implantation. Monatsschrift für Geburtshilfe und Gynäkologie, 1926, lxxiii, 1.

Last year Unterberger reported 3 cases in which he performed tubal implantation. In one case pregnancy immediately followed the operation. In all 3 cases two Rubin tests were done before operation and one during the operation but all the tests were negative. The proximal end of the retained part of the tube was implanted into the uterine cavity through a sagittal incision in the fundus. This is the first case of pregnancy following tubal implantation in Europe. (In America, Watkins and Cullen reported pregnancies following tubal implantation.)

In Unterberger's case the pregnancy was entirely uneventful. Delivery was accomplished by a low forceps operation. There was no postpartum hemorrhage and the puerperium was normal. In this case the uterine incision withstood not only the increased intrauterine pressure incident to pregnancy but also the contractions of labor.

The chief indication for tubal implantation is disease of the isthmal portion of the fallopian tube, such as salpingitis isthmica nodosa, cornual myoma and tubal pregnancy in the isthmus. J. P. GREENHILL.

HOW SHALL WE DEAL WITH THE CANCER MENACE?*

By Gilbert Fitz-Patrick, M.D., F.A.C.S., Chicago, Ill.
(Chairman Illinois Branch, American Society for the Control of Cancer)

During the past half century notable progress has been made in the scientific knowledge and treatment of disease, with the result that there has been a marked increase in the average duration of human life. A comparison of morbidity and mortality statsities shows a decided decrease in the incidence of all diseases except one. This one disease specter, which stands out conspicuously and defies all human progress, not only has not decreased its human toll, but is constantly increasing it, so much so that its destruction almost nullifies all the good that has been accomplished in other directions. Smallpox, diphtheria, tuberculosis, syphilis and a host of other death-dealing agents have been conquered, but cancer still stands in our midst defiant and unconquered.

This is the menace, the terrific importance of which to the whole nation, I wish to discuss in a general way; to outline its extent, its economic and social aspects, its cause as far as is known, and what might be expected in regard to dealing with it as a national health problem.

I can only present you with these general facts as far as observable by a clinician coming into contact with many cancer cases and following the development of the different phases of the cancer problem; but I can also assert that cancer is one of the most serious menaces which threatens us; that its increase is real and not apparent; and that it is not confined to any class of persons, or to any locality, but in general, striking the rich and poor, the weak and strong, the dweller of the town and of the open spaces, and seeking its victims at random from North to South, and from East to West.

STATISTICS OF CANCER

A recent analytic study of cancer mortality in the Registration Area of the United States by Schereschewsky of the United States Public Health Service, shows that there has been a pronounced increase in the observed death rate from cancer in persons of forty years and over. About one-third of this increase is due to greater precision and accuracy in filling out death certificates. The remaining two-thirds is, however, an actual increase in mortality, resulting in a death rate between 25 and 30 per cent higher than it was twenty-one years ago. During the same period, Schereschewsky finds that there has been a decrease of more than 40 per cent in tuberculosis mortality and nearly 50 per cent in the mortality from typhoid fever.

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*Read at a meeting of the Chicago Gynecological Society, January 21, 1927.

Massachusetts has the highest death rate from cancer of any State, equal to 126.8 per 100,000 population. In 1925 the cancer mortality in New York City reached 110 per 100,000.

According to statistics compiled by Hoffman, there is a real and alarming increase in cancer all over the world; not only among old people, but in the age group from thirty to thirty-nine years.

In the State of Mississippi the number of cancer deaths in 1925 was 50 per cent higher than in 1914.

The figures furnished by the Department of Public Health of the State of Illinois show that there were 6091 deaths in the State from cancer in the year 1921. In the year 1924 this had increased to over 7,000. In cities of 10,000 or more population in the same State, cancer deaths increased from 3,987 in 1921 to 4,580 in 1924.

Dr. G. H. Soper, in a recent article in the *Journal of Cancer Research*, states that, based on statistical studies, there are at the present time about 300,000 cases of cancer in the United States, and that the number of cases are about equal to three times the annual death rate. Hence we may take the annual toll from cancer as 100,000.

Soper states that at the request of the American Society for the Control of Cancer, the United States Census Bureau made a recalculation of the cancer death rate in the Registration Area of the United States, the revised rates throwing an entirely new light on the distribution of cancer. They show that the crude rates which are commonly employed are not only seriously in error, but positively misleading. There is actually much less difference in the prevalence of cancer in Northern and Southern States than has hitherto been supposed. According to Soper, the latest available information indicates that in the United States cancer is responsible for one in every eight of all deaths among men between fifty and seventy years old, and for one in every five among women between forty-five and sixty-five years old.

The statistical studies made by Dublin show that in the last fifteen years there has been an increase of 47 per cent in deaths from cancer in men over fifty years old and of 21 per cent in women above fifty.

THE ECONOMIC AND SOCIAL ASPECTS OF THE CANCER MENACE

Let us glance for a moment at this cancer question from an economic and social standpoint. The actual money-earning capacity of a man or woman in the fifth and sixth decades of life is of course less on the average than in the more active decades. Yet on the other hand, as we well know, the fifth and sixth decades are the periods when judgment is ripe, based on long experience, and viewed from this standpoint, people of this age are the most valuable economically and socially of all persons in any community; but reducing the matter crudely to dollar values, I think most of us would agree that persons in the cancer age are on the average worth at least five hundred dollars annually to the nation. Since 100,000 die of cancer each year, if this scourge were abolished, it would mean fifty million dollars added to the national wealth each year. This may be considered as what cancer is costing us now in lost production quite apart from the actual cost to these unfortunate patients themselves or to the community for medical and hospital care. Of course, money figures of this kind are merely speculative approximations, and on the mere economic aspect I will only say that it has been reiterated again and again that public money spent in fighting and warding off disease yields the highest ultimate returns. As a public economic measure it would pay a community to spend money freely for preventing and fighting cancer.

Now let us look at the social and sentimental aspects of cancer. Cancer strikes us down when we have just arrived at the years of maturity, serenity, and discreet judgment; when we are most capable of appreciating and enjoying the best that human life and hope can give; when our long-sustained efforts and plans have reached the fruition from which we should justly hope to benefit; when we are surrounded by children and life-long friends and should reasonably expect that contemplative enjoyment which comes from work well done. Instead of the gradual, calm, and peaceful passing into the sleep of death without pain or remorse, which should be the happy ending of a well-spent life, foul cancer makes us a horrible leprous object shunned by those who are dearest to us, and both they and we ourselves can only wish for a speedy death as a merciful riddance of the gloom and misery of the horrible malady. How are we to avoid this awful fate? Cancer will surely take one out of every five women and eight men of middle age who will die in this community, and which of us will it be? We are careful to watch for the bandit on our highways; we bolt and bar our doors against the thief and assassin who comes in the night, but what are we doing to disarm this fiend who will take a much heavier toll from us than the bandit and midnight assassin?

WHAT IS CANCER?

Although medical science has accumulated a very large amount of knowledge concerning the evolution of cancer; although an army of the most astute and well-equipped workers all over the world are engaged in endeavoring to solve its nature, yet we must confess that at the present moment, we are in the dark as to the exact nature of cancer. Still a cordon is being drawn as it were about it; and it is very likely that its exact cause and nature will soon be fully demonstrated. It will be appropriate here to glance succinctly at some of the most widely held views as to the nature of cancer.

First, let us review the germ theory: Many have claimed the discovery of a cancer germ. The most recent important contribution on this head was that put forward in July of 1925 by Gye and Bernard, but other investigators have failed to substantiate Gye and Bernard's claims.

The old irritation theory of Virchow cannot be considered as causal, but rather as a favorable and exciting circumstance in connection with the development of cancer. Just as certain locations in the body are sites of election for the settlement and breeding of specific bacteria, so are traumatized areas most likely places for the development of cancer; but most especially if the traumatism be continuous. Constant irritation or traumatism as an exciting factor is universally acknowledged, but it must not be considered as causative.

The trend of all important scientific research into the cause of cancer at the present moment seems to connect it with changes in the nutrition or metabolism of the cell; that is to say, to regard cancer as an abnormal cell development due to some disturbance between the balance of growth and function in normal tissue cells; or by a disturbance in the chemical balance of the cell constituents. Of course, this does not really get at the root of the question, because such cellular changes must still depend upon some ulterior causal factor.

To illustrate: I may refer to the fact that Clowes and Frisbie observed that in tumor growths there was also a disturbance in the potassium and calcium contents of cells. In a young, fresh, rapidly growing tumor, excess of potassium was always the rule; but in a degenerating tumor calcium was in the ascendent. But just how such a chemical disturbance in cell life occurs is not known.

Burrows has put forward an ingenious theory that cancer is the result of vitamine imbalance in the cells. Cancer cells contain no vitamine A but a high value of the fat-soluble vitamine B.

Sokoloff has perhaps done the most scientific work in investigating the relationship of the cell to cancer. Sokoloff's studies of cellular reaction and the problem, whether due to age or to the influence of mechanical or chemical irritants, affect the intracellular relationships and cause what is called cellular anarchy; that is to say, complete absence of the routine, orderly, normal development of the cell. Sokoloff finds an increased amount of glycogen in the malignant cell which seems to be directly responsible for increased growth energy. I have already referred to the potassium calcium imbalance in malignant cells, and both may be connected.

We cannot, however, consider cancer merely as a mechanical or chemical matter. The human or metaphysical aspects must be taken into account. There is an agency beyond our control which regulates the functions of the body and correlates them with growth. This agency regulates new growth by replacing the tissue lost or changed by necessary function. A loss of the balance between growth and function may be and apparently is concerned in the development of cancer. We know that it is a physiologic law that failure of an organ to function leads to its atrophy, and misuse of function may also in the same way lead to abnormal growth and the conditions which predispose to or cause malignancy.

Some writers lay stress on the physiologic inactivity of organs being a causal factor in the production of cancer, especially cancer in the reproductive organs of the female. In Norway, Gade has remarked that cancer of the breast is more prevalent among women who do not nurse their children than among those who do. In the United States, Adair and Bagg have remarked the same thing.

These writers have made a very careful clinical study of 200 women suffering from *mammary* cancer in the hospital of the Cornell University Medical College. They found that in 91.5 per cent of these women there had been at one or more times a well-marked occurrence of breast stasis; i.e., milk stagnation or prevention of lactation when it was physiologic. *Mammary* cancer they consider is due to breast stasis and the resulting irritation that follows the retention of stagnant secretions in the breast.

Moreover, any organ which is not used for its legitimate physiologic purpose is likely to undergo involutive changes, and in the breast fibromatosis is likely to occur accompanied by connective tissue and epithelial proliferation. In such cases any chronic irritation, functional or other, may lead to fibroadenoma and carcinoma.

In this connection, I would like to hint that there may in the same way be a possible connection between the rapid increase in uterine cancer and the corresponding decrease in the bearing of children. It seems to be more than a mere coincidence that there should be a parallelism between the two, especially as the greatest increase in uterine and mammary cancer is observed in those countries in which race suicide is most prevalent. It was formerly believed that the constant uterine irritation incident to frequent childbearing was a cause of cancer. Statistics do not support this view except where the frequent childbearing was unaccompanied by proper lactation. Indeed, regarding this view, I may cite Dr. H. Gideon Wells, our distinguished pathologist, who recently pointed out that the dairy cow, which has the most overworked mammary gland in the world, never develops carcinoma and that the human subject which does less work in bearing children than any other animal, is the only one that has carcioma of the uterus with frequency. I do not wish to be misunderstood as regards physiologic functioning. A woman who bears a child and who refuses to use her lactating breasts is irritating them and not functioning physiologically; similarly a woman who persists in marital intercourse, which reflexly causes changes in the uterus incidental to pregnancy, but who at the same time constantly avoids pregnancy, is misusing her organs, and not functioning physiologically. Function is thwarted and the balance between it and growth is changed. The virgin, on the other hand, is not misfunctioning. As stated, I only hint this as a matter which may or may not be proved by further special study. What we know is that the United States leads the world in the prevalence of cancer of the female generative organs, nearly 50 per cent of all cancers in women being of this kind; at the same time such cancer is most frequent in those sections of the United States, such as Massachusetts, where the birth rate is lowest among the married population. Verbum sat sapienti!

In a general way, we may say that none of the existing views regarding the cause of cancer appear to be of any absolute value. All that we can with our present knowledge say is that tumor growth originates following repeated stimulation of tissue, whether such stimulation be a physical or chemical irritation or arising from parasitic or bacterial agencies. The recent International Conference for Cancer Control held at Lake Mohonk, New York, came to the conclusion that cancer was neither contagious nor infectious, and that it was not hereditary, although there appeared to be to some extent a susceptibility to it.

WHAT SHALL WE DO ABOUT CANCER?

As we do not know the underlying cause of cancer, our attitude toward it must of necessity be twofold: first, we must as far as possible, check the ravages of cancer by preventing its occurrence as far as it is in our power; and second, in the case of established cancer, we must cure it if possbile; or if not, at least prolong the life of the cancer patient and make it as tolerable as possible. In addition we must make every effort to discover the origin and nature of cancer.

The first step toward the prevention of cancer is the thorough instruction of the people and medical profession in regard to the conditions that lead to it, and to watch for and recognize the premonitory signs, the danger signals of cancer. When we consider that one woman out of every five and one man out of every eight of middle age will die from cancer, it is certainly a matter which must of necessity be of vital concern to every one of us. The cancer menace must be made to loom large in the public eye by continuous advertising in public places, by newspapers, and by every public agency. The public must become familiar with those early danger signals of cancer which can be recognized without a special knowledge of the subject. Spasmodic action is very well, but the thing that counts is reiteration of warnings. Ceaseless activity through the public press, and the fact that it reaches and is constantly read by the entire community makes it the best medium for disseminating information regarding the danger signals of cancer; but such dissemination must be constant. A mere "Cancer Week" in a community is excellent, but has only an ephemeral value. I wish particularly to stress the fact that the cancer menace must be kept constantly in the public mind.

The value of periodic examinations in the case of persons above the age of forty years cannot be too constantly impressed on the public. Also, family physicians should warn their patients of cancer age and advise examination for the premonitory signs of cancer; and otherwise, whenever the opportunity offers, they should themselves look out for such signs. To wait until there are manifest symptoms is a fatal policy. I think that in the past many physicians have been remiss or careless in this respect.

It is not alone, however, in middle-aged persons that the incidence of cancer should be suspected; a tendency is observed for the appearance of cancer in young persons. Fowler mentions 112 cases of pathologically demonstrated carcinoma and epithelioma in persons under twenty-six years old at the Mayo Clinic within ten years.

The question of immunization against cancer rises here. While experimental work gives a certain amount of promise of immunity to cancer through the blood (being possible), yet this subject is not at the present time in a stage in which it can be regarded as practical.

DIAGNOSIS OF CANCER

Twenty years ago cancer was a diagnostic clinical entity, today it is a microscopic fact. The future must develop both for the suspected and actual cancer patient a reliable biologic diagnostic test, a test that will rule out cancer or show its presence (in the organism) with certainty. Such a test would be of incalculable value in the initial stages when cancer gives no clinical symptoms. Even when suspicious clinical evidence is present, the average patient procrastinates, and it has been calculated that the average cancer patient delays eight months after premonitory signs before consulting a physician. Of course as we might surmise, certain tests are claimed as being diagnostic for cancer. In the Kotzareff's diagnostic test, an injection of radiocolloidal substance is made into the blood stream. If cancer be present, it is claimed that the rapidly dividing cells of the tumor fix the radium to such an extent that they will affect a sensitized plate.

Botelho also has recently devised a nitric reaction, a diagnostic test which although not exactly specific for cancer, yet seems to be the most reliably known method of serodiagnosis of malignant tumors.

Lavedan has recently reported a series of 111 cases of confirmed cancer in 74 per cent of which Botelho's test was positive. The great majority of these cases were breast and uterine cancers. These tests require extensive laboratory procedures, and besides they are more applicable to advanced cancer. But what we want is a more simple method that will detect the very early specific changes, if any, that a developing cancer causes in the blood. The tests mentioned might perhaps be of use in a completely equipped cancer laboratory, but they scarcely come within the scope of the ordinary practitioner's armamentarium and he must still rely on his clinical acumen.

PUBLIC CANCER HOSPITALS AND CLINICS

One of the points upon which I desire to lay very particular stress is that the menace of cancer to the nation is so great, and the means of handling it so entirely inadequate, that its control must become a matter of State and National concern. The drain on our people from the fatal toll gathered by cancer renders it imperative that a determined public effort should be made for its prevention and control, and for applying such treatment as can be afforded. The reasons for State control of the cancer problem may be briefly summed up as follows:

1. Because special cancer hospitals with suitable equipment and personnel are required in which cancer patients can be received free or at a minimum payment according to their resources.

2. Because special Cancer Clinics in connection with the Cancer Hospitals are necessary, where anyone can have an examination to determine whether or not cancer is present, and if present to be promptly treated.

3. Because special clinical and laboratory research work is necessary. The laboratories would best function in connection with cancer hospitals where every clinical phase of the disease could be studied. The research work now being done is principally by privately endowed institutions.

These reasons call for little discussion, and further good reasons might be added. As regards the necessity for special cancer hospitals it is well known that there are entirely insufficient accommodations in our existing general hospitals. In fact, many hospitals refuse to receive inoperable cancer patients, who are sent home to die slowly. The average time for which an advanced cancer patient requires hospitalization before death, varies from about four to six or eight months. There is, I think, no more unfortunate being than the hopeless cancer patient lingering on at home for a year or two in bodily and mental anguish, a living death with the depression that is cast upon all, family and friends, by the knowledge that they can in no way help to obviate the inevitable issue. Formerly, when cancer cases were much fewer, there was a sufficient number of so-called Homes for Incurables, but the number of such cases now is so great that they cannot be handled in this way even if such institutions were available. Besides this, a proper cancer hospital needs very special equipment and a specially trained staff.

The existence of trustworthy cancer clinics where an honest and unbiased examination and reliable diagnosis will be made, will also work great good among the large number of men and women who are nervous wrecks owing to their fear of cancer. There are many such people and they are the easy prey of quacks and cancer fakirs of all kinds. When it is fully known that these clinics have no monetary advantage in diagnosing a case as cancer, they will receive full public confidence.

These hospitals and clinics should offer an opportunity for special study by graduate students, as it is quite evident from the vast number of patients who, either through neglect or ignorance, are permitted to develop into an advanced condition of cancer that the general rank and file of the profession needs a better acquaintance with the initial phases of the disease.

CONCERNING THE TREATMENT OF CANCER

I may be permitted to say a few words here as to the treatment of cancer. While in the early stages surgery has been proved to be the best treatment, yet recurrence in advanced cases after surgery is so frequent that the difference in life duration between advanced operated and nonoperated cases is only a few months on the average. Radium and x-ray appear to be quite efficacious in certain early well localized cancers, and also as adjuncts to surgery when surgery is indicated.

Even in operable cancer of the cervix, some surgeons have abandoned surgery altogether in favor of radiologic treatment, as being more effective and less of a risk.

The newer researches on the nature of cancer would seem to suggest that, if this disease be really a disturbance in the cell nutritional balance, it may be possible to check it by direct medication through the blood. This branch of the therapeutics of cancer has been sadly neglected for many years owing to the supremacy of surgery. Thus Blair Bell, of Liverpool, England, and others, have shown that the administration of certain colloidal metallic salts, acts favorably on cancer cells. Bell has apparently obtained some remarkable results by the use of colloidal lead in the treatment of 250 hopeless human cancer patients; this treatment is being scientifically investigated in England with the aid of public funds. Bell claims that by this means, tumors may be made to shrink and disappear; also that colloidal lead has apparently a selective action on rapidly growing tumors. Bell further thinks that whatever risk may accompany the administration of lead, it is justified by the results obtained. The lead treatment offers a chance for complete cure in one of five hopeless cases. This is the first time that medical treatment of cancer has offered a cure, and it may be the forerunner of other and better methods.

The efficient treatment of cancer requires the coordination of a group of physicians specifically trained in different specialties involved in dealing with cancer, and well acquainted with the phases of the disease.

PUBLIC INTEREST IN REGARD TO THE CANCER MENACE

In Europe the control of cancer has long been recognized as a matter of proper public concern and steps have been taken for its prevention and treatment. France, Switzerland, and Belgium have anticancerous centers under government auspices and the same matter is progressing in England and elsewhere. The Public Health Committee of the League of Nations is dealing with the matter. Germany, Sweden, Denmark, and Austria have special Public Cancer hospitals and Research Institutions.

In the United States we are just beginning to recognize the public aspect of the cancer menace. The State of Massachusetts took up the study of cancer as a State problem. They recognized that the problem was a large one, possessing complex medical, social, economic, and humanitarian aspects. Legislation providing public funds for cancer hospitals and clinics was passed in April, 1926.

Pennsylvania is also doing some work along the same lines. The report of its Cancer Commission shows that thirteen years of educational work has cut down the period between the discovery of the first symptoms in suspected cancer cases and the first call on the doctor from eighteen to fourteen months; and in cases of deep-seated cancer to nearly one-half. While this is not a very great accomplishment in itself, it is a basis at least for greater results from a proper and thorough State control of the cancer problem.

Finally, I wish to say that when the public understands and fully realizes the nature of the cancer menace, and how it is coming directly home to each one of us, it will rise up and demand public concerted action and the expenditure of public money for its control. The matter is not one to be trifled with. It is only by concerted intelligent cooperation between the medical profession and the public, that the cancer menace can be averted and the question of cancer solved. In the past, public insistence on the adequate treatment of tuberculosis has cut the death rate in two. Public demand has resulted in vast public expenditures in protecting the sources of water supply, in preserving the purity of food supply, and in obviating the spreading of infections and contagious diseases. The same public demand will awaken the medical profession and legislators to the necessity of dealing adequately with the cancer menace. It seems reasonable at least that any steps which would be likely to prevent the occurrence of cancer and to provide adequate care for those afflicted with it, as well as a properly directed effort to find the real underlying cause of cancer and its treatment, should be fitting objects for the expenditure of public money. It is the people's government, and the people's mandate as regards matters which concern them must be acted upon by the people's elected representatives. Remember that one out of every five women, and one out of every eight men of middle age are now dying from cancer, at least a full decade before their natural time to die.

REFERENCES

Schereschewsky, I. W.: U. S. Pub. Health Reports, 1926, xli, 1. *Hoffman, F. L.:* cited by Soper. *Crawford, W. W.:* New Orleans Med. and Surg. Jour., October, 1926. *Soper, G. H.:* Jour. Cancer Res., 1926, x, 267. *Dublin:* cited by Soper. *Gye and Barnard:* Brit. Med. Jour., 1925, ii, 189. *Clowes, C. N. A., and Frisbie, W. S.:* Am. Jour. Physiol., 1905, xiv, 173. *Burrows, I.:* Jour. Cancer Res., 1926, x, 239. *Sokoloff, B.:* Jour. Cancer Res., 1925, ix, 464. *Gade:* Norsk Mag. f. Laegevidensk., July, 1925. *Adair, F. E., and Bagg, H. J.:* Internat. Clin., 1925, iv, 19. *Dietrich:* Deutsche. Ztschr. f. Chir., 1926, cxcv, 145. *Wells, H. Gideon:* Jour. Cancer Res., 1925, ix, 501. *Kotzareff, A.:* Schweiz med. Wchnschr., 1926, lvi. 151. *Botelho's* Reaction (Peracchia) Tumori, 1925, xi, 318. *Lavendan:* Bull. de l'Acad. de méd., Paris, 1926, xcv, 543. *Crile, G. W:* Jour. Mich. State Med. Soc., 1926, xxv, 124. *Bell, W. Blair:* Lancet, 1925, ii, 1003. American Soc. for Control of Cancer: Campaign Notes No. 9 as regards State of Penn. *Petitt, J. A.:* Northwest Med., 1921, xx, 25.

122 SOUTH MICHIGAN AVENUE.

(For discussion see p. 684.)

CANCER OF THE UTERUS FOLLOWING AN INTERPOSITION OPERATION, WITH A REVIEW OF OTHER REPORTED COMPLICATIONS[*]

BY JOHN A. MCGLINN, M.D., F.A.C.S., PHILADELPHIA, PA.

UNTIL a comparatively recent period prolapse of the uterus, with its attendant cystocele and rectocele, was probably the most difficult problem the pelvic surgeon was called upon to solve. The efforts of the older surgeons were in the main unsatisfactory. They were diligent in their efforts and acrimonious in their writings and debates.

In Dewee's *Diseases of Females* published in 1837, we find that the profession was at loggerheads as to the value of conservative treatment as instanced by the use of the pessary, astringent douches, astringent applications to the vagina, and closure of the vagina by adhesions, from the use of caustics on the one hand and operative procedures on the other. The operation then practiced consisted in a denudation of the vulva with suture of the two sides together, so that the opening into the vagina was practically closed. If the operation proved successful the patient was cured to the extent that the uterus could no longer project from the vagina. Dewees in speaking of the operation closes the chapter in this manner: "This horrible, severe, and ill-described operation is seriously proposed by Dr. F. (Dr. Frick) as a substitute for the simple, successful, and easily managed pessary."

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[*] Read at the Fifty-second Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 23-25, 1927.

Except for the work of Professor Burns, quoted in Ashwell's *Diseases of Females* published in 1845 and the operations to repair the lacerated cervix and operations on the anterior wall of the vagina introduced by Marion Sims, little progress was made in solving the problem between the years of 1840 and 1880. Burns' contribution was a notable one. He had as clear an idea of the anatomy of the pelvis and the anatomic causes of prolapse as we have today.

Byford, in 1881, was advocating the use of pessaries and astringents and criticizing the surgeons because in their operations they addressed themselves to but one item in the case. T. Gaillard Thomas[1, 2] described his method of operating as follows: "The cervix is repaired, using silver wire: the second step in the case will be the taking of a 'gore,' so to speak, in the anterior wall of the vagina by the operation known as elytrorrhaphy, and then the final operation will consist in the restoration of the destroyed perineum."

The majority of authors, of this period, held that lacerations of the perineum were the most important etiologic factors. W. V. Jackson,[3] however, made this observation: "I have never seen a case caused by a ruptured perineum nor have I met with a case cured by sewing up such a laceration."

James P. Boyd[4] noted that the condition at times appears in virgins. He gave as causes: falls, torn perineum, and weight of uterus.

The next ten years show a marked advance in the treatment of prolapse, and we find the surgeons of 1890 making use of the ligamentary supports of the uterus in attempts to effect a cure.

Singley[5] wrote: "There are two types of cases, those due to relaxation of the pelvic peritoneum (meaning ligaments) and those due to relaxed and torn perineums." He reports a case of failure after a Hegar operation which was cured by an Alexander operation.

Surgeons of this period were not in accord as to the cause and cure of prolapse. I. B. Will[6] said of the chaotic condition of the subject: "The theories advanced have been well-nigh innumerable and the treatment advanced ranging all the way from that of a Virginia physician who hung his negro patients head downward and poured the vagina full of a decoction of tan bark, up to the most expensive silver and gold-plated uteroabdominal supports of modern times, on the one hand, and the narrowing of the vagina by plastic operations to the shortening of the round ligaments on the other."

The treatment by pelvic massage, after the method of Thure Brandt, of Stockholm, was also in vogue during this period.

In 1900 we find a definite advance in the treatment of prolapse. Watkins[7] discussed methods of treatment in vogue at this time. He then described his method of operating, which was essentially a vaginal fixation of the uterus. Watkins eventually developed this operation into the interposition operation, one of the most important contributions to gynecologic surgical technic.

The first vaginal fixation was done by Schucking[8] in 1888, and Sänger[9] described the operation in the same year. The operation was also described by Mackenrodt[10] and Dührssen[11] in 1892, and by Kuster[12] in 1894. Vaginal suspension was proposed by Vineberg[13] in 1896 and also by Wertheim[14] in the same year. These prior operations had to do with the correction of retrodisplacement of the uterus, and Watkins was the first to make use of the principle for the cure of prolapse.

Gynecologists were not all in accord with Watkins. Deaver[15] advocated ventral fixation while Smith[16] favored vaginal hysterectomy and plastic work. Werder[17] advocated curettement of the uterus, amputation of the cervix, anterior and posterior colporrhaphy and ventral fixation; E. E. Montgomery,[18] in discussing Werder's paper, suggested shortening of the uterosacral ligaments.

Fritsch[19] proposed an unique operation. He anteverted the uterus through an anterior vaginal section, brought the fundus down into the vagina and sutured the body of the uterus both to the anterior and posterior vaginal walls.

The literature on this subject from 1900 to the present time is so voluminous that it is impossible to review it in a paper of this character. Of the many important contributions dealing with the anatomy of the pelvis may be mentioned: The description of the ligamentum transversus colli by Mackenrodt and papers by Jellet,[20] Tweedy,[21] Keyes,[22, 24] Williams,[23] and Fitzgibbon.[25] Many communications were presented dealing with the operative cure of prolapse. Of great value were the various papers of J. Riddle Goffe in which he described two bladder suspension operations. Important also were those of Alexandroff[26] and Tweedy,[27] dealing with Mackenrodt's ligament for the cure of prolapse; of Jellet[25] and Bovée on the shortening of the uterosacral ligaments; ventral fixation by Harris, Murphy, Baldy, and Kocher and the Mayo interposition of the broad ligaments.

Out of all this flux has come one operation that seems destined to stand the test of time, an operation which when done in properly selected cases guarantees almost 100 per cent of cures, the perfected interposition operation of Watkins.

It is too much to expect any operation to be perfect in all respects and it may be profitable to review some of the complications which have followed this operation.

H. N. Shaw[29] reports 118 cases of interposition operations on patients at the Johns Hopkins hospital. These were done chiefly on dispensary patients in whom the follow-up questionnaire could not be obtained in a number of cases. However, in those cases where the end-result was obtained there was but one real failure. This patient was a scrub-woman who worked very hard. She had a recurrence of her prolapse with prolapse of the entire pelvic floor, the bladder appearing at the vaginal orifice as a red ulcerated mass with the uterus still below it. A ventrofixation was easily performed and but few adhesions to the uterus were encountered. In this series of cases there were two subsequent pregnancies, both with great discomfort during pregnancy and very difficult labors.

C. Jeff Miller[30] reports 50 cases of interposition operation from his private practice. All were effective in relieving the prolapse for which they were done. Three women suffered with incontinence, in one case coming on after six years of complete cure, another occurring on slight jolts or jars, and the third occurring in an extremely neurotic patient without other demonstrable cause. None of these patients were cystoscoped to determine the presence of a local cause for the incontinence.

H. Boldt[31] reports a case of uncontrollable hemorrhage following an interposition operation. The bleeding could not be controlled even by zinc chloride, and a hysterectomy had to be performed two and a half years after the original interposition operation. The hysterectomy was very difficult and a large tear was made in the bladder. On pathologic examination of the uterus nothing but chronic endometritis could be discovered.

Polak,[32] in discussing the paper by Boldt, stated that he was obliged to perform hysterectomy in four cases on account of menorrhagia following interposition operations. In all these cases the interposition operation had been performed after the menopause. On account of the extensive adhesions usually encountered in such cases he now leaves a portion of the body of the uterus as a floor for the bladder instead of attempting to dissect out the entire bladder.

I. F. Stein[33] reports four cases of pregnancy following interposition operations. All were delivered by cesarean section. In one case the child was stillborn. He calls attention to the marked prevalence of transverse presentations and of placenta previa in the reported cases of pregnancy following the interposition operation. He also notes the posterior sacculation of the uterus, the marked bladder symptoms, the severe abdominal pains, and the incontinence or inability to void spontaneously during pregnancy. He also calls attention to the ineffectual labor pains, the danger of rupture of the uterus, the difficulty of applying forceps, performing craniotomy or other operative procedures per vaginam and to the practical necessity of doing cesarean section in all cases. He strongly urges that the interposition operation be reserved for postclimacteric cases or that artificial sterilization be performed when the operation is done in the childbearing period.

Loomis[34] reports one case of pregnancy with placenta previa following the interposition operation. Davis[35] reports one case of pregnancy delivered at term by section with no unusual features. Hertleson[36] had a case of pregnancy terminated by a very difficult craniotomy, after seven days of labor, followed by severe maternal sepsis.

Freund[37] reports a case of pregnancy delivered by section with no unusual features.

Esch[38] had to resort to section to deliver his case.

Graefe reviews eight cases of pregnancy reported in the German literature and adds a case of his own. In this latter case pregnancy had to be terminated by vaginal cesarean section on account of pain and retention of urine.

Weibel[39] reports seven cases of pregnancy following the interposition operation. Five are from the German literature and two from the Frauen Klinik at Wien. One patient aborted at the fourth month and the other was terminated ten days short of term by section on account of polyhydramnios and severe abdominal pain.

O. V. Franque tells of a case of pregnancy two years after the tubes had been resected at the time of the original operation. The patient had retention of urine and had to live a catheter life during pregnancy. This case was terminated by section.

Holland[40] collected three cases of pregnancy from the English literature. All had to be terminated by cesarean section.

Weber[41] reviewed forty-three cases of interposition operation with 2.4 per cent recurrence of the prolapse. All the other cases were entirely successful. Two cases of pregnancy occurred in the series in both of which a resection of the tubes had been done at the time of the operation. He believes that conception had occurred prior to the performance of the interposition operation and now advises a preliminary curettage in all cases.

Grad[42] studied twenty-three cases after the operation. Nineteen were entirely successful, two were partly so, one had a recurrence of the rectocele and one had a shortened anterior vaginal wall. One patient died of gangrene of the left leg. There was one case of pregnancy with break down of the perineum following labor.

Josef Pepper[43] reviewed the question of priority and gives Watkins credit for originating the operation. In his early experience with the operation his mortality was between 6 and 7 per cent; it is now less than 2 per cent. Since 1915 all cases of prolapse in his clinic have been treated by interposition. Between 1915 and 1920 ninety cases were so treated, four of these as reoperations after failure of other operations. There were two deaths, one from bronchopneumonia and one from septicemia. He had 92.4 per cent complete cures; 6.4 per cent partial failures, and 1.2 per cent total failures. There were several cases of menorrhagia following the operation. In one case hysterectomy was done, and x-rays cured the others. He mentions a case of Wertheim's[44] in which hysterectomy had to be done on account of hemorrhage. He had no cases of malignancy in his clinic.

Halban and Thaler each report one case of pregnancy both of which aborted at the third month.

Mainzer, Lynch, and Kosmak each report a case of pregnancy terminated by section.

Cragin had two cases of pregnancy terminated by section at full term.
and the other was sectioned.

Westermack cites a case of bleeding and discharge five years after the operation. It was impossible to enter the uterus through the cervix. The fundus was approached through the anterior vaginal wall. A small fibroid was found in the fundus following the removal of which recovery ensued.

Hirst has had three cases of pregnancy: two patients aborted at the third month

To these reported complications I desire to add another, the counterpart of which, I have not been able to find in the literature.

In all, I have seen three cases of intractable bleeding after the interposition operation. One patient operated upon by another surgeon two years previously, came under my care complaining of persistent bleeding. The operative result was excellent and there were no ulcerations of the vagina or cervix. The bleeding was coming from the interior of the uterus and as the uterus could not be entered through the cervix, splitting the uterus through a vaginal incision was advised. This advice was not accepted and the patient was lost sight of.

The second case, Mrs. K., aged fifty-six, was operated upon by me in April, 1924, for complete prolapse of the uterus and vagina. The uterus was curetted and a lacerated and ulcerated cervix was treated by high amputation. A typical Watkins' interposition operation and colpoperineorrhaphy completed the operative procedures. She made an uncomplicated recovery with cure of the prolapse. The histologic studies of the cervix and curette scrapings were negative for malignancy. She remained well until about September, 1926, when she began spotting, which continued at irregular intervals until January, 1927, since which date the bleeding has been continuous. She entered St. Agnes Hospital, February 1, 1927. Examination on that date showed an excellent operative result with vagina and cervix free of disease. The uterus well anteposed, was normal in outline but somewhat larger than it was at the time of operation.

The uterus, on account of its position, was entered through the cervix with great difficulty. The uterine cavity was curetted and a 50 mg. capsule of radium was inserted and allowed to remain in the cavity for twenty-four hours. Histologic studies of the curette scrapings showed adenocarcinoma. As the malignancy was situated in the body of the uterus we did not care to depend on radium and a complete hysterectomy was advised. On February 16 an attempt was made to free the uterus and remove it through the vagina. This was found impossible of accomplishment, and the uterus was removed by the abdominal route.

The bladder was densely adherent to the posterior wall of the uterus, with the uterus deep in the pelvis, the fundus being firmly fixed under the pubic arch. No point of cleavage could be found between the uterus and bladder, and they had to be separated by scissors dissection. On account of the depth of the organs in the pelvis and free bleeding, dissection had to be done by touch and not by sight. Fortunately the bladder and ureters were not injured. After the bladder was freed an attempt was made to free the uterus from the vagina. Again no point of cleavage could be found, and it was necessary to cut the uterus out with scissors guided by touch. When the uterus was removed it showed the anterior vaginal wall densely adherent to its anterior surface. The rent in the vagina was closed and a small wick of gauze drainage was inserted to take care of the oozing which could not be completely controlled.

The uterus showed a small polyp at the fundus which on histologic examination proved to be an adenocarcinoma.

The patient was discharged from the hospital in satisfactory condition one month later. The most noteworthy feature of the operation was its extreme difficulty.

A third patient upon whom I operated six months ago for complete prolapse entered the hospital today (May 13, 1927) complaining of severe bleeding for the past month. In this case the uterus was curetted, the cervix amputated, the uterus interposed, and the perineum repaired. Examination of the patient revealed a partial failure, the cervix being near the vulva with some prolapse of the bladder. Situated in the cervix was a proliferating ulcer about one-half inch in diameter.

From this review the following conclusions can be drawn:

1. In properly selected cases the Watkins' interposition operation is the best treatment, so far devised, for the cure of prolapse of the uterus and vagina.
2. Pregnancy is a serious complication when it follows the operation. Practically all cases so far reported had to be terminated by cesarean section.
3. If the operation is done before the menopause, artificial sterilization should be done.
4. Cancer may develop in the uterus after the operation. The operation does not play any part in the development of cancer, and the fact that it may occur in no way condemns the operation.

5. All diseased cervices should be removed by high amputation.

6. Bleeding from the body of the uterus after the menopause should be a contraindication for the operation.

7. Hysterectomy, after the operation is likely to be a hazardous and difficult operation.

REFERENCES

(1) Boston Med. and Surg. Jour., October 27, 1881. (2) Boston Med. and Surg. Jour., November 10, 1881. (3) Australian Med. Jour., December 15, 1881. (4) Med. Ann., Albany, July 1, 1881. (5) Tr. Royal Acad. Med. in Ireland, 1889, vii. (6) West. Med. Reporter, December, 1899. (7) Am. Gynaec. and Obst. Jour., 1899, xvi, 420. (8) Centralbl. f. Gynäk., 1888, No. 12. (9) Ibid., No. 2, p. 34. (10) Berlin, Gynec. Sec., May 27, 1892. (11) Centralbl. f. Gynäk., 1892. (12) Deutsch. med. Wchnschr., 1894, No. 19. (13) Med. News, March 14, 1896, p. 288. (14) Centralbl. f. Gynäk., March 7, 1896. (15) Am. Jour. Obst., 1900, xli, 478. (16) Ann. Gynaec. and Pediat., 1900, xiii, 813. (17) Am. Gynaec. and Obst. Jour., 1900, xvi, 13. (18) Ibid. (19) Centralbl. f. Gynäk., 1900, xxiv, 49. (20) Jour. Obst. and Gynec. Brit. Emp., 1912, xxi. (21) Jour. Obst. and Gynec. Brit. Emp., 1912, xxi. (22) Am. Jour. Obst., September, 1913. (23) Ibid., April, 1915. (24) Ibid., October, 1915. (25) Surg., Gynec. and Obst., July, 1916. (26) Zentralbl. f. Gynäk., 1903, xxvii, 762. (27) Loc. cit. (28) Loc. cit. (29) *Shaw, H. N.:* Surg., Gynec. and Obst., 1922, xxxiv, 395. (30) *Miller, C. J.:* Surg., Gynec. and Obst., 1924, xxxviii, 348. (31) *Boldt, H.:* Am. Jour. Obst., 1918, lxxviii, 111-113. (32) *Polak, J. O.:* Discussion of above paper. (33) *Stein, I. F.:* Jour. Am. Med. Assn., 1923, lxxxi, 468. (34) *Loomis, F.:* Discussion of above paper. (35) *Davis, A. B.:* AM. JOUR. OBST. AND GYNEC., 1923, v, 201. (36) *Hertelson:* Frommel's Jahresb., 1912, p. 89. (37) *Freund, R.:* Ztschr. f. Geburtsh. u. Gynaek., lxvii, 551. (38) *Esch:* Gynäk Rundschau, 1911, p. 335. (39) *Weibel:* Arch. f. Gynaek., 1916, cv, 65. (40) *Holland:* Jour. Obst. and Gynec. Brit. Emp., 1921, xxviii, 358. (41) *Weber, F.:* Monatschr. f. Geburtsh. u. Gynäk., 1920, liii, 77-87. (42) *Grad, H.:* AM. JOUR. OBST. AND GYNEC., 1924, viii, 163. (43) *Pepper, J.:* Monatschr. f. Geburtsh. u. Gynäk., 1921, liv, 236-244. (44) *Wertheim:* Zentralbl. f. Gynäk., 1896, xxv, No. 4, p. 1899.

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(For discussion, see p. 670.)

Graca, Ludevit; A Check Pessary in the Uterine Os as Cause of Chronic Polyarthritis. Bratislavske Lekarkse Listy, 1925, v, 27.

In this case the etiologic relation of a chronic polyarthritis to a cervical check pessary could be clearly established. A young woman was for five years treated for a severe articular rheumatism when a uterine hemorrhage appeared. This seemed caused by a cervical stem pessary worn by her for years. It was promptly removed, and not only all hemorrhage ceased but also prompt improvement of the joint affection could be noticed. The only slightly affected joints became perfectly normal, and those chronically changed exhibited marked amelioration.

AUTHOR'S ABSTRACT.

RESPIRATORY EMPHYSEMA IN LABOR*

With Two New Cases and a Review of 130 Cases in the Literature

By Charles A. Gordon, M.D., F.A.C.S., Brooklyn, N. Y.

THE occurrence of air in the subcutaneous tissues is an unusual and interesting complication of labor,—an accident probably occurring more often than has been recorded in the literature, and interesting because of the dramatic onset of the lesion and our lack of positive knowledge of its etiology and pathology.

Case reports are usually prefaced by unsupported statements as to its rarity,—Charbonnet in 1925 stated that "a search of the literature has failed to disclose mention of a single case."

Air has, of course, been observed in the cellular tissues of the neck and face in conditions other than parturition, as in measles, whooping-cough, pneumonia, foreign bodies in the bronchi, wounds of the lung itself, tracheotomy wounds, and even from blowing the nose. In labor, too, we must carefully distinguish between subcutaneous emphysema arising from the activities of gas-forming organisms in the birth canal, or that occasionally seen with penetrating wounds, ulcerating growths and rupture of the uterus, and emphysema due to a rupture somewhere in the respiratory tract. Although usually accompanied by a definite clinical picture of vastly different significance and import, some confusion exists because all these have been called subcutaneous emphysema of labor; while Champneys in 1842 spoke of expiratory cervical emphysema, no other term has ever been suggested.

If the presence of air in the cellular tissues during labor were classified from its point of origin, that arising from the genital tract might be called peritoneal emphysema and all the rest, respiratory emphysema of labor. The need of a more definite terminology in obstetric emphysema is apparent.

Although possibly not unknown to early medicine, no historical references could be found. Louise Bourgeois, however, midwife to the Queen of France, publishing her "Observations" in 1617, may have referred to it when she wrote: "I saw that she tried to stop crying out, and I implored her not to stop, for fear that her throat would swell."

The first case was reported by Simmons in 1783. Since then many cases have been reported, and from time to time some effort has been made to collect cases and evaluate experiences. De Paul in 1842 first drew attention to it, and in 1874 Haultecoeur wrote the first thesis collecting 13 cases. Champneys in 1885 attempted to explain its etiology by a series of experiments. Roche collected 32 cases in 1894, Nicaise 54 cases in 1896, Klots 40 cases in 1899, and Kosmak, reporting a case in 1905, with the only photograph in the literature, was able to find 77 cases. Since then no complete report has appeared.

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*Read at a meeting of the New York Obstetrical Society, February 8, 1927.

It seemed advisable, while reporting two cases of my own, both observed in the Greenpoint Hospital, to review all the cases in the literature and bring Kosmak's series down to date. In all 50 new cases have been found, 22 of these escaping Kosmak's search, and the others appearing since the publication of his paper. These with the 77 cases reported by Kosmak make a total of 130 cases, which I believe includes all the cases in the literature after a careful search in which all the original sources since 1617 have been consulted. My own cases follow:

CASE 1.—A. S.; white, primipara, aged twenty-three, was admitted at term, to the Greenpoint Hospital on October 4, 1924 in labor. Her pregnancy had been normal except for persistent vomiting. Her heart and lungs were negative, blood pressure 126/84, and external pelvic measurements were ample, intercristal 25 cm., interspinous 23 cm., external conjugate 20 cm., bisischial 8.5 cm. The fetal heart rate was 138, and the position left occipitoanterior.

The first stage was prolonged with strong regular three minute interval pains. At the twelfth hour, ¼ gr. morphine was given; at the sixteenth hour the right side of her face and neck was seen to be swollen, and within the next half hour this swelling spread to the left side and back of the neck, and down the chest to the nipple level. Air crepitation was felt over this area and slight tenderness was present. Her general condition was excellent, and there were no subjective symptoms except discomfort due to the swelling. Her cervix was but half dilated, the membranes still intact, and the slow descent of the head was thought to be due to poor flexion. Six hours later with full dilatation the membranes ruptured, and forceps were applied to the head under ether anesthesia. The swelling had not increased. Delivery was somewhat difficult, and the baby was stillborn. The baby was large with large head and marked moulding and caput. The placenta was easily expressed after separation, and a second degree laceration of the perineum was repaired at once.

Eight hours after delivery the emphysema was seen to have spread over both sides of the face to the scalp of the parietal region. She made an excellent recovery with slight febrile reaction for four days. Her blood count the day after delivery was R. B. C. 4,550,000, Hgb. 83 per cent, W. B. C. 12,600, lymphocytes 26 per cent, polymorphonuclear cells 73 per cent. The emphysema had entirely disappeared on the fifth day.

CASE 2.—M. C. white, primipara, aged twenty, was admitted at term, to the Greenpoint Hospital on September 24, 1926 in labor. At six years of age, two ribs on the right side had been resected for empyema. Her pregnancy had been normal, heart and lungs were negative, blood pressure 134/90 and the external pelvic measurements were ample, intercristal 27 cm., interspinous 24 cm., external conjugate 20 cm., bisischial 8 cm. Enlarged thyroid.

The first stage lasted twenty-eight hours, but except for the last two hours, pains were irregular and never closer then fifteen minutes. Two hours before complete dilatation, the membranes ruptured, and pains became stronger and closer. After a second stage of almost six hours she was delivered spontaneously of a living child, weighing 3,800 gm.

After waiting forty-five minutes for separation of the placenta, Credé expression was unsuccessful, sharp hemorrhage occurred, and the placenta was removed manually and the bleeding stopped.

Three hours before delivery swelling of the right side of the neck and face was noticed and a crackling area of emphysema was found to extend on the right side from the infraclavicular space to the zygomatic arch, on the left side of the neck from just below the clavicle to the lower jaw and backward to the trapezius muscle. Except for slight difficulty in breathing and slight cough she felt well. Convalescence was uneventful and afebrile throughout, the emphysema gradually disappearing; on the fifth day it was present only just above the right clavicle, where the presence of air could be detected for five days more,—ten days in all.

The blood count on the day after delivery showed R. B. C. 3,550,000, Hgb. 60 per cent, W. B. C. 10,000 with 32 per cent lymphocytes and 68 per cent polymorphonuclear cells. Urine and Wassermann tests were negative. Roentgen examination by Dr. Van Winkle on the day after delivery showed evidence of air or gas in the soft tissues, especially the right and left infra- and supraclavicular areas. The lung fields showed no evidence of infiltration or opacity. Right and left large cervical ribs were present. The heart shadow showed no abnormality in outline.

Another roentgen examination made ten days later showed no shadows suggesting air in the soft tissues of the neck. The apices were clear, and the lung fields showed no infiltration or opacity. No fracture of the cervical ribs was seen. Rib deformity present in the lower right chest, at the site of the old resection. At this time a careful examination of the chest was made by an internist who was able to find nothing abnormal except the old operative scar. The heart was negative and the lungs perfectly clear. No evidence of old pleural pathology could be discovered.

Laryngoscopic and bronchoscopic examinations were made on the third day postpartum. Nothing abnormal was seen.

Both these cases occurred in healthy young primiparae with somewhat prolonged labor, due in the first case to disproportion, and to a poor first stage in the other. Labor pains and straining were no worse than usually seen in primiparous women. In the first case no predisposing cause could be found, while old pleural pathology may well have been the underlying cause in the other. Their clinical course was similar. The cases recorded in the literature, however, differ widely from each other, yet have much in common. In order to establish a continuity of research, and provide a proper background for the study of this interesting clinical phenomenon, all the cases in the literature not abstracted by Kosmak in the Bulletin of the Lying-In Hospital of the City of New York, March, 1907, are abstracted below. The first reported case is worthy of literal reproduction.

"A case of Emphysema, Brought on by Severe Labour Pains. Communicated by Samuel Foart Simmons, M.D., F.R.S., Read June 17, 1783 (*Medical Communications*, Lond., 1784, i, 176).

"In a conversation with Dr. Bland, physician, man midwife to the Westminster General Dispensary, I happened to mention the remarkable case communicated lately to the Society by Dr. Hicks. This brought to his recollection a curious instance of a similar affection, which occurred to him several years ago in a female patient, and which was evidently the effect of severe labour pains. As cases of this sort are extremely rare and interesting, and do not seem to have been hitherto sufficiently noticed by medical writers, I requested Dr. Bland to give me the particulars of the fact in writing, and he has accordingly favoured me with the following account, which I shall present to the Society in his own words: 'Mrs. J. Ismay, the wife of a watchmaker in Chancery Lane, a strong and healthy young woman, in the course of a tedious and uncommonly severe labour forced a quantity of air into the cellular membranes of her neck. Her whole face and neck and the upper part of her body were enlarged; her eyes were inflamed and her eyelids so swelled that for some time afterwards she could with difficulty open them. The space occupied by the emphysema might be covered with a hand, and the center of it was about the point where the right clavicle joins the sternum. It was not perceived until the day after the patient was delivered, but the crackling occasioned by pressing any part of that space left no room to doubt what the tumour contained. It occasioned but little trouble or uneasiness, and was entirely dissipated within ten or twelve days.' "

Frank, J. P.: *Traite de Medicine-Pratique,* Paris, 1842, ii, 11.

"The emphysema occurring during labor, when the woman throws her head back is caused by tears in the larynx or trachea. We saw in one woman the swelling start in the neck, spread to the face, head and all the upper part of the body; it disappeared in twelve days."

Davies, F.: *Prov. M. and S. J.,* 1845, p. 147.

On December 10, 1829 at 6:00 P.M. he saw a primipara. After almost three days of labor, straining violently in her second stage, she was delivered normally at 5:00 A.M., December 13. Fifteen minutes after delivery of the placenta, she complained of great difficulty in breathing and he saw her face, throat and breast swollen to three times their normal size and of a bright scarlet color. She also had great pain in her throat, about two inches above the sternum and difficulty in breathing increased rapidly. He felt a distinct crackling and felt that she had ruptured her trachea. Pulse 110. Venesection 30 oz., and again 16 oz. She had had severe postpartum hemorrhage. Rapid recovery and argument for bleeding from the arm in P. P. hemorrhage.

Rump, H. R.: *Assn. Med. Jour.,* 1853, pp. 365-9.

Primipara, aged twenty-six, was in coma for three days with many severe eclamptic convulsions. Phlebotomy. During a convulsion her neck suddenly increased in size, and marked emphysema spread over her face and entire body. Delivery shortly after. Slow absorption of air. Recovery.

Three patients consulted him for a tumor in the neck which had appeared during labor. In all three the tumor disappeared or grew smaller during inspiration and increased in size during expiration. Mass soft, elastic, tympanitic, and not tender.

1. During her third labor she felt something burst in her neck and swelling suddenly appeared on the right side of the neck. This tumor increased in size with five subsequent labors.

2. During her first delivery, aged twenty-three. while bearing down she felt something give way in her neck. This tumor grew larger in two subsequent labors.

3. During her first delivery, aged twenty-two, she felt a tearing sensation in the neck, and while bearing down swelling appeared. Enlarged during subsequent labors, and Mr. Parry whose case it was, saw a remarkable increase in its size during expulsive pains.

Lize, M.: *Bull. de la Soc. d. Chir. de Par.*, 1860, i, 529.

Primipara, age seventeen, robust, after four days of extremely difficult labor L. O. A., delivered spontaneously. During this time she had not ceased crying. After delivery a tumor the size of a first was noted extending from the inner half of the clavicle to the angle of the jaw. Mass was pear-shaped, boggy, elastic, giving way under pressure without diminishing in size, and tympanitic on percussion. The tumor increased in size when she cried out. Two days later the mass was but half its original size, and on the ninth day the neck was almost normal. The mass was not present before labor began.

Pratt, T.: *Med. Press and Circ.*, Lond., 1870, lx, n. s., 409. Discussion, 411.

Primipara, aged twenty-three, strong and healthy. Labor in all eight and a half hours. One hour before delivery with head on perineum she complained of stiffness of the eyelids and swelling of her face. As labor progressed so did the swelling until her eyes were nearly closed and face, neck, chest and greater part of her body puffed, much difficulty in breathing, marked crepitation over swelling. Twenty minutes later her baby was born. Swelling was very bad the next day but gradually lessened and was entirely gone on the eighth day. Her elder brother and several of her uncle's children had died of tuberculosis.

2. Primipara, aged twenty-three, healthy. Normal presentation. Two and a half hours after rupture of the membranes, fourteen hours after the onset of labor, she complained of stiffness of the eyelids and swelling of the face. The baby was born two hours later and was very small. Labor throughout was feeble, sixteen and a half hours in all. Emphysema spread over face, neck, chest, arms and greater part of her body. She had no difficulty in breathing. On the eighth day it had disappeared. Her father had married three times and had a very large family all of whom died of tuberculosis except two.

Kirkpatrick, J. R.: *Med. Press and Circ.*, Lond., 1870, lx, n. s., 411.

Discussing Pratt's case, Kirkpatrick said he had seen a case in a multipara with emphysema which extended over lower part of the chest and body and disappeared the next day.

O'Leary: *Med. Press and Circ.*, Lond., 1870. (Quoted by Roche, original reference not found.)

Woman, aged twenty-six during miscarriage made violent efforts. Emphysema spread over the entire neck and a great part of the chest. Auscultation of the lung showed a cavity in the apex which apparently had ruptured.

Isdell, J.: *Irish Hosp. Gaz.*, Dubl., 1873, i, 38.

Isdell saw two cases in thirty years. One, a second labor, had some obstruction in the second stage. While making violent expulsive efforts swelling suddenly appeared in her neck and increased with each pain, spreading over the face and down the chest, arms and leg. The strange part was that it stopped exactly at the midline and was all on the right side. The swelling was so great as to impede respiration and there was danger of suffocation. Bleeding followed by delivery with forceps. Disappearance of air in two weeks.

2. Primipara with pains of great violence was first seen in the second stage with head low. Forceps. Her face and neck puffed out so as to alarm those about her.

Dunn: *Boston Med. and Surg. Jour.*, 1883, cviii, 397.

Dr. Otis, discussing Dunn's case (Kosmak) said that in a case that had come under his observation the symptoms were not discovered until two hours after the labor was over.

Greslou, M.: *Soc. Obst. et Gynec. de Par.*, 1891-2, pp. 211-12.

Primipara, aged twenty-four, with no previous lung pathology, delivered spontaneously, a baby weighing 4 kg. in right occiput posterior position. First stage, thirty hours; second stage only two hours; toward its end during sustained forcible effort, she suddenly felt her right cheek swell and a sensation of crackling; a soft painless swelling was felt at this point. During subsequent efforts this air spread to the neck and after delivery distended both sides of the face tremendously. Coughing and thoracic distress for two days when swelling rapidly subsided.

Roche, F. N.: 4°, Paris, 1894. Reports three cases of M. Pinard.

1. Primipara, aged twenty-three in good health. Twenty-four hours in first stage L. O. A., two hours in second stage. After delivery she complained of her neck and showed area of emphysema at base of neck especially on right side, anterior chest to nipple level. Recovery.

2. Primipara, aged twenty-two, negative history. L. O. P. Twenty-four hours in first stage. After seven hours in the second stage, no rotation, delivery was effected by forceps. Two hours after delivery complained of dysphagia, dyspnea and pain in breathing. Emphysema noted in neck, face and chest, anteriorly to nipple level and posteriorly to scapulae. Subsided in ten days.

3. Primipara, aged twenty, L. O. A. Seventeen hours in first stage; three hours in second stage. Spontaneous delivery. After delivery she complained of pain and swelling of the neck and emphysema was noted on both sides of the neck and face, particularly marked in parotid region. Recovery.

Freeman: *Lancet*, Lond., 1896, i, 705.

Primipara, aged twenty, slight, healthy woman with good previous history, in labor first stage nine hours. Second stage was terminated by spontaneous delivery three hours later. Pains of second stage very severe. One hour before delivery she said her face felt tense and swollen and it was seen to be swollen. After delivery "her face was enormously distended as well as her throat, shoulders and chest down to about her third rib." Marked crackling. Complaint of breathlessness and constriction of throat. During efforts to expel the placenta, swelling increased and the breathlessness became worse. Firm pressure on the neck relieved her temporarily. Emphysema disappeared on fourth day.

Szekely, Z.: *Gyogyaszat*, Budapest, 1901, xli, 537. Also translation: *Pest. med-chir. Presse*, Budapest, 1901, xxxvii, 949-952.

Primipara, aged twenty-nine at term. Over a year before had pain in the side, cough and hemoptysis. During labor had hemoptysis three times but had not coughed for three months before. Two days in first stage with weak pains; nine hours in second stage with unusually severe pains due to large baby and rigid soft parts. Face, upper and lower eyelids, neck of right side suddenly swelled up during these pains and swelling spread over whole face, neck, chest, back and abdomen. Labor lasted long after the appearance of the air which kept on increasing during labor. Swelling was normal in color, not tender, no increase in temperature. Spontaneous delivery. Three days later head was much swollen (twice its size). Emphysema extended to symphysis. Examination of chest showed only roughened breathing at right apex.

Essen-Moller, E.: *Hygiea*, Stockholm. 1901, 2. f., iv, 708-714.

Primipara probably, although not stated, unmarried, at term. After fifteen hours of good pain in the first stage, cervix was almost fully dilated, membranes ruptured, and the brow fixed in the pelvis. Low contraction ring. Morphine and chloral. Twelve hours later marked emphysema was seen on neck, face and upper eyelids, left arm to wrist, slightly on right arm, chest and abdomen to the umbilicus. Weakness, dyspnea, and thoracic distress. Forceps delivery of live baby. Dyspnea persisted a few days and disappeared with the emphysema which was still present in the infraclavicular fossae when was discharged on the tenth day.

Emmerson, W. M.: *Lancet*, Lond., 1904, ii, 595.

Primipara, aged twenty-two, in good health and in labor thirteen hours with a face presentation, had a normal delivery. With strong labor, head on the perineum for one hour, immediately after the last pain which was long and very severe, her face was seen to be swollen, and she complained of dyspnea. On the next day swelling was seen on neck and chest. This lasted four days. No pneumothorax. No discomfort except choking sensation and slight shortness of breath. Convalescence was uneventful, and careful subsequent examination of the chest revealed no alterations in the percussion note at the apices, or elsewhere, and no signs of tuberculosis. Emmerson believed her condition to be due to "rupture of air vesicles on one or both sides of the chest, caused by the violent bearing down effort, the air escaping into the neck at the root of the lung." Fetus was stillborn with posterior hydrencephalocele and omphalocele.

Hergott, A.: *Ann. gynec. et d'obst.*, Par., 1904, 25, i, 643-650.

Primipara, aged twenty-eight, vertex, long first stage with poor pains and slow progress in the second. After four hours with the head almost at the vulva, 50 cg. of quinine was given. A half hour later she delivered. Just before delivery she suddenly felt pain in the left side of the chest and had difficulty in breathing. At that moment, she said her neck began to swell. A few hours later mediastinal emphysema was found, and the next day emphysema was present on both sides of the neck, left supraclavicular fossa, and the chest over the first two interspaces. Six days later it had all disappeared.

Smith, W.: *Stethoscope*, Bristol, 1904, vii, 43.

Primipara, aged twenty-seven, healthy but very thin. Labor progressed slowly until perineal stage. Pains then became strong and lasted much longer. Then eyelids suddenly became swollen and she could not see out of left eye. Swelling rapidly spread over whole face, neck and anterior chest to the third rib. On the fourth day it disappeared.

Viana, O.: *Ginecologia,* Firenze, 1907, iv, 164-175.

Primipara, aged twenty-one, obese, "constantly suffering from coryza." At term, pains weak and infrequent, she progressed slowly, head long time on perineum, membranes ruptured artificially at the vulva, and she delivered spontaneously after being in labor eighteen hours. During the second stage swelling of the left cheek was noticed. After delivery, the entire left and upper anterior chest as well. Crepitation. No pain but sense of tension over face and some dysphagia. Examination of lungs negative. Next day right cheek was swollen; on the third day swelling was seen over the left lacrimal duct area. All had disappeared on the sixth day. Examination of nose and throat showed swelling of left side of the pharynx, negative larynx. Probe demonstrated roughness in nasolacrimal duct where it was thought air had broken through.

Basso, G. L.: *Ginecologia*, Firenze, 1907, iv, 723-728.

Primipara aged thirty-one, always well except for frequent nosebleeds during pregnancy. Vertex, L. O. A. First stage lasted twelve hours, membranes ruptured early. During the first hour of the second stage, with great effort in bearing down swelling appeared over the left cheek, then the right, spreading to the eyelids, orbit, neck and chest over the sternum. Dysphagia and nasal voice. Forceps delivery. The emphysema had disappeared by the sixth day. Examination of the lungs, larynx and lacrimal apparatus was negative. The mucous membrane of the nose showed crusts, bleeding and mucopurulent catarrh.

Jardine, R.: *Jour. Obst. and Gynec. Brit. Emp.*, Lond., 1907, xi, 413.

Primipara, aged twenty-two, four hours after midwife had ruptured the membranes, felt a choking sensation and fulness in her neck. This increased with every attack of vomiting and quickly spread to the face and eyelids. When admitted to hospital, she was exhausted, with face much swollen and neck, chest and part of abdominal wall emphysematous as well. All more marked on right side. Very little discomfort except on deep inspiration, when she complained of lacerating pain over the apices of both lungs. Pulse very feeble, 130. Retraction ring. Distended bladder. Os slightly dilated manually and forceps tried with no result. Craniotomy. Emphysema all disappeared on the seventh day. Recovery uneventful. Careful examination of her chest showed nothing except that the breath sounds over the apex of the right lung were somewhat harsh but there were no râles. Slight cough but no expectoration.

Fabre and Trillat: *Bull. de la Soc. d'obst. de Par.*, 1908, xi.

Primipara, aged eighteen, subject to coughs. After a labor of seventeen hours membranes ruptured, violent expulsive pains occurred and the head was found on the perineum. Caput was seen at vulva for four hours, pain getting worse, when the head was delivered in posterior position by means of a fillet. Laceration of perineum sutured. After delivery noticed emphysema of cheeks, neck and subclavicular region. Patient was positive that she had felt her left cheek swelling and discomfort in the neck during her expulsive efforts. Very little pain. No lesion of trachea, mouth or lungs found on examination. Two days later the emphysema had spread symmetrically down the chest to the nipple level and to the back of the neck. Disappeared entirely in eight days.

Lederer: *Frauenarzt*, Leipz., 1908, xxiii, 388-390.

Para ii, aged thirty-five, marked albuminuria, no edema and blurred vision. Normal birth of small baby after short labor. Total blindness followed. Twenty-four hours later, neck was swollen but not painful. No difficulty in breathing. Emphysematous area covered lower jaw. On the third day the abdomen was so swollen that ribs and pelvic bones could not be felt. On the sixth day it had all disappeared. Died three years later of contracted kidney.

Gilles: *Toulouse med.*, 1906, 2. s., viii, 138.

Primipara aged thirty, three hours in her second stage, normal until, suddenly following a tremendous effort she felt a tearing sensation in the thorax during which some swelling progressively spread over neck and face. In few minutes she was of monstrous aspect and hardly recognizable and lost her voice. Swelling was especially marked at base and lateral aspect of neck, along large vessels, under chin, eyelids, cheeks, and in front of ears. Skin over these areas showed singular pallor. Air crepitation there. Forceps used as air reached the base of chest. Placenta easily expressed. Emphysema was absorbed rapidly and next day face was normal. Photograph was taken twenty-four hours later (not found in this journal, however). Aphonia and slight impediment in swallowing had not disappeared. Her general condition was always excellent. Never had any respiratory trouble. Lungs had never been anything but negative.

Siegelstein, M. J.: *Jour. Am. Med. Assn.*, Chicago, 1911, lvii, 285.

Primipara, aged twenty, with a vaginal septum ¼ inch thick extending from just below the urinary meatus to the fourchette. She was admitted in labor with a three finger cervix, unruptured membranes, and head engaged in right occipito-anterior position. Seven hours later the membranes ruptured, pains became more frequent, and, as the vertex was dilating the introitus, she made excessive efforts to overcome this obstruction. While straining, a swelling suddenly appeared on the right side of her neck and around the angle of the jaw gradually covering that side of the face and completely closing the right eye. When the septum had broken through and delivery was accomplished, the swelling had spread to the root of the neck and upper part of the chest. Crepitation. No redness, pain or tenderness. Tympany, distant breathing and fine crepitant râles over the swelling. It had all disappeared in ten days.

Cunnington, C. W.: *Lancet*, Lond., 1912, ii, 1012.

Primipara, aged twenty-three, in good health. Thirteen hour labor. During last half hour of the second stage, the pains were "very severe." Fifteen minutes before the head was born, she noticed swelling of the neck. Two hours after the third stage, her face was swollen and cyanosed with eyes almost closed, and the lips swollen and blue. Emphysema extended up to the scalp, all over the neck and chest to the lower ribs, back, and upper arms. Heart or lung sounds could not be heard. No pneumothorax. Temperature 101, pulse 140. Small and weak, respirations 28 and shallow. Slight discomfort in breathing. A week later had only one small patch of crepitation over the third intercostal space near the sternum.

Stocks, M.: *Lancet*, Lond., 1912, i, 722.

Primipara aged twenty, in labor about thirteen hours, vertex, good uterine contractions with strong voluntary efforts. When vertex was just about beginning to make pressure on the perineum, the nurse reported that the patient's face was swelling, and that this increased and was accompanied by cyanosis during the pain. Emphysema extended over the right side of the face. Forceps were applied and a living child delivered. Seven hours later air was present over an area including both sides of the neck, both sides of the face up to the orbital ridges, the whole of the right side of the thorax, limited by the costal margin below, the spine behind, and the sternum in front, the right upper arm to the extent of a third, and the left shoulder. No symptoms except some pain in the chest and at the back of the neck. Good recovery, swelling all disappearing in eight days.

Gilbert, H.: *Australas. Med. Gaz.*, Sydney, 1913, xxxiv, 583.

Primipara, aged twenty-two, in labor twenty-four hours, cervical os the size of a half dollar. Two hours later she was fully dilated with the head well down on the perineum. Four hours later pain "going off," he was called and told that her neck had begun to swell one-half hour before. He applied forceps with vertex crowning and delivered easily a stillborn fetus, weighing seven pounds, two ounces, in the left occipitoanterior position. Her appearance was striking. The curves of the neck were almost obliterated, giving her a curious frog-like aspect. Crepitation was present over a wide area of swelling which involved both sides of the neck, upper eyelids and face including the lobes of the ears, the chest down to the nipples, axillae, and the upper part of the back nearly down to the lower angle of the scapulae. It was more marked on the right side where it had first been noted. Tenderness. No pneumothorax. Frequent short cough and respiratory distress were troublesome for two days. Up to the eighth day all the air had not gone.

Smeed, E.: *Lancet*, Lond., 1914, ii, 445.

Primipara, aged twenty-two, good family and personal history. Normal pelvic measurements with left occipitoanterior position. Two hours after beginning of the second stage, during which the pains had been strong and frequent, swelling of the right side of the neck and face was noticed, completely closing the right eye; slight swelling on the left side. At this time under chloroform anesthesia the head was delivered by pressure on the fundus. Until the patient was fully anesthetized the emphysema increased on both sides, and spread over the entire sternum, neck and face. No pneumothorax. Air had entirely disappeared on twelfth day.

Murray, J.: *Brit. Med. Jour.*, Lond., 1917, i, 14.

Primipara, aged twenty-four, attended by a midwife, was in labor fourteen hours when he was sent for. On his arrival she presented a most alarming appearance. Her face was scarlet, and swollen to twice its normal size with both eyes completely closed. The upper part of the chest wall, and the neck were also much swollen, soft to the touch, and crackling everywhere on slight pressure. Interference with respiration led the midwife to believe that her patient was dying. Forceps delivery of an abnormally large fetus with a large caput succedaneum. After twenty hours the emphysema had somewhat abated.

Milne, G.: *Brit. Med. Jour.*, Lond., 1917, i, 262.

Primipara, aged twenty-two, normal and healthy showing no sign of disease of heart or lungs. Good pelvic measurements. Labor lasted seventeen hours, of which the first stage occupied fourteen. About an hour before delivery, she felt something go "pop" and swelling of the right eyelid was noticed. After delivery she complained of slight substernal uneasiness, but otherwise felt quite well. Typical crackling felt all over the face except the forehead and chin, over the neck and anterior chest to breasts, and the right side of the back as low as the scapula. No superficial cardiac dulness was present, and the note at the right apex was boxy in character. Breath sounds otherwise quite normal. The air had entirely disappeared within five days.

Good, J.: *Lancet*, 1920, i, 120.

Primipara, aged twenty, "healthy woman with small pelvis and a big child." Labor was much prolonged with head three hours on the perineum. When first seen at this time she complained of sore throat and difficulty in breathing. Lying on her left side with face crowded into the pillow, the right side of her face was much swollen, the eye closed, with swelling extending down face and neck. She was delivered with forceps. The next day her face was uniformly puffed up owing to change of posture; neck distended and swelling extending down over thorax. She had slight cough, but the swelling was everywhere subsiding. Auscultation was unsatisfactory on account of the subcutaneous crackling.

Vermelin, H.: *Bull. Soc. d'obst. et de gynec. de Par.*, 1921, x, 530.

Primipara, aged nineteen, at term left occipitoposterior position. Cervix fully dilated in fifteen hours and, with strong bearing down pains, the head appeared at the vulva in thirty minutes. All progress then stopped in spite of strong uterine contractions and examination showed a badly flexed incompletely rotated head with large caput on a thick perineum. Forceps extraction of a stillborn fetus. The next day emphysema of the face, neck and upper chest, more marked on left side, was noted. This disappeared in six days.

2. Primipara, aged twenty-two, at term, always well. Membranes ruptured prematurely and first stage of labor lasted fifteen hours. Because of poor uterine contractions in the second stage, two unsuccessful attempts at forceps delivery of a head high in the pelvis were made before admission. Five hours later spontaneous delivery of a stillborn fetus weighing 3700 gm. occurred. The next day marked emphysema of the chest and neck and face to the right parotid region was seen. Febrile convalescence with rapid disappearance of the swelling on the left side, more slowly on the right where first noted.

Riediger, K.: *Zentralbl. f. Gynäk.*, Leipz., 1922, xlvi, 1910-1912.

Primipara, aged twenty-five, pleurisy two years before. Eclampsia with two convulsions. Twenty-two hours in labor with strong pains, when first seen. Emphysema present in neck to infraclavicular region; left side of face was more swollen than the right. The swelling increased, almost closing the eyes and crept down the chest a few hours later. Venesection, manual aid, and Smellie-Veit in a breech delivery. Baby alive weighed 3530 gm. Few hours after delivery had pain in face and chest, but swelling did not increase. Disappeared in fourteen days. Examination of chest by internist showed slightly diminished breathing in right apex; no râles. X-ray negative.

Reckitt, J. D. T.: *Lancet*, Lond., 1922, i, 843.

Primipara, aged twenty-two, at eight months, ill for over two weeks with influenza and bronchopneumonia both lungs with high temperature, cough and blood streaked expectoration, weak heart sounds and dyspnea. Delivery of a stillborn fetus by the breech. Two days later his attention was called to a swollen condition of the face and right eyelids. On the next day much worse, right eye being quite closed, with lids enormously swollen; the face, forehead, neck and chest swollen also. Orthopnea urgent and only sitting position in bed tolerated. Next day air spread to both arms, back of hands, abdomen and back. Her condition was grave owing to cardiac weakness and dyspnea. Emphysema much improved but was still present over arms, hands and chest, but had practically disappeared from her face twelve days later. Absorption was complete in two weeks since onset had passed.

Davidson, A. H.: *Irish Jour. Med. Sc.*, Dublin, April, 1923, 79-80.

Primipara, probably, although not stated, aged twenty-one, at term, reached her second stage in twelve hours. Pains during first stage and first part of second stage were normal in force, but as the head (a normal vertex) came down on the perineum patient bore down with frantic efforts to expel it. As the head showed, in a few minutes her face was seen to be markedly swollen, especially about the eyelids so that the eyes were almost closed. No complaint except a little pain about her face and of not being able to see well; swelling extended down to neck and chest. Some tenderness and marked crackling and slight swelling down both arms, all over back, chest and abdomen to the umbilicus. No dyspnea or pain in the chest. Lungs negative. Uneventful recovery with disappearance of all swelling in eight days.

Mittweg: *Zentralbl. f. Gynäk.*, 1923, xlvii, 243-244.

Primipara, aged twenty-one. Four years before had bilateral catarrh of both lung apices. In labor twenty hours with membranes ruptured for one and a half hours, and strong, expulsive pains. Examination showed negative heart and lungs and marked emphysema of both cheeks, chin, upper and lower eyelids, conjunctivae, lower half of forehead, neck, shoulders, extensor surfaces in upper third of both arms, chest to the nipple level and back to the middle of the scapulae. Delivery by forceps under chloroform anesthesia of a vertex in mid pelvic arrest. Baby alive, weighed seven pounds. After delivery the emphysema did not increase and had entirely disappeared in three weeks.

Harvey, D. A.: *Brit. Med. Jour.*, Lond., 1924, i, 1089.

Primipara, young and healthy (age not stated) "with frequent strong pain." Progress being slow, when fully dilated she was delivered with forceps without undue difficulty under chloroform anesthesia; the baby weighed nine pounds and was strong and healthy. Nine hours later her face and neck were found to be swollen. Harvey saw it the next day, and "found the neck and adjacent parts over the clavicles" emphysematous. Absorption took place in one week. No symptoms are mentioned. The patient could not remember any pain in the chest during her labor.

Hansell, A. W.: *Brit. Med. Jour.*, 1924, ii, 104.

Primipara, young and healthy (age not stated) while having strong and regular pains complained that her right eye was swelling. This swelling gradually increased and extended all around the neck, the upper part of the chest and down the right arm. ''Labor was somewhat delayed owing to the presenting part being a face, and it was ultimately terminated with the assistance of forceps.'' The emphysematous area was tender for several days, but had completely subsided about a week later.

Charbonnet, P. N.: *Surg., Gynec. and Obst.*, 1925, xl, 105-106.

Primipara, aged eighteen, heart and lungs and pelvic measurements normal, in labor at term with blood pressure 240 and edema of feet and face. After labor of about twenty-four hours she was delivered of a nine and a half pound baby with episiotomy, no forceps or anesthetic. A few hours afterward she complained of pain in the neck and difficulty in breathing and swallowing. Emphysema of the interior of the mouth and throat, face, neck and chest to the level of the second rib, was then noted. No discoloration. Temperature and pulse were normal but respirations were slightly labored. Disappeared by eleventh day, anterior chest last.

Oppenheimer, W.: *Monatschr. f. Geburtsh. u. Gynäk.*, 1925, lxx, 243-248.

Primipara, aged twenty-three, never sick, lungs negative, pelvis rhachitic, and slight edema of lower legs. After thirty-four hours in labor, with severe pains, she delivered spontaneously. At the end of the second stage, she had swelling of the upper eyelids, and three hours later, complaining of pain in the neck, a swelling was seen, especially on right side, along jaw to shoulders, whole face and chest to nipple level. This receded slowly but was still present over clavicles on eighth day. No dyspnea, tachycardia or cyanosis. Internist reported lungs negative except for diminished breathing on left side posteriorly. X-ray showed perfectly normal lungs.

Lauritzen, A. G.: *Ugesk. f. Laeger.*, Kjobenh., 1925, lxxxvii, 938.

Primipara, aged twenty-one, normal measurements, in labor fifteen hours with a 4 cm. cervix and head firmly engaged. Three hours later found cervix obliterated, patient with very strong pains at three minute intervals. Face was swollen; breathing painful; dysphagia; stiffness of neck; talked with difficulty. Swelling increased with every pain. By time birth occurred one half hour later, patient was unrecognizable, head and neck enormously swollen, eyes closed. Face pale. Cardiac dulness had disappeared, heart sounds were distant and mediastinal emphysema was demonstrable. Lungs negative. In a few days normal heart dulness returned. Emphysema disappearing entirely in seven to eight days.

All the cases reported have been studied with the hope of reaching definite conclusions as to the factors concerned in the production of this very interesting phenomenon.

In determining what may be termed predisposing causes, we find the lesion occurring in all but a few cases in primiparae. Although seen in women with definite pulmonary lesion such as pneumonia or tuberculosis, it has been most commonly observed in robust young primiparae where no evidence of any lesion could be found.

The bearing down effort seems to occupy a definite place in its etiology, even though many cases have had a relatively easy delivery.

Dystocia, however, is common and most cases have had long labor. Disproportion, dry labor, rigid soft parts, poor positions of the vertex, and a slowly dilating cervix are commonly reported. Usually observed during the second stage of labor, it may occur in the first and frequently is not noted until the delivery has been completed.

Its rarity alone would seem to indicate that the simple physiologic effort of parturition is not sufficient, and yet it does not follow that there must be a predisposing cause. If we say that air gains access to the cellular tissue through a solution in continuity of the respiratory tract,—and no other hypothesis is possible, the break may occur at any point, where there may be a lesion, or even in normal tissue, where other factors of stress are adequate.

There has been much speculation on the mechanism of its production. Only clinical deduction may be made, as very little experimental research has been done. Only two cases died, de la Salle's and de Paul's (Kosmak), the one coming to autopsy showing a rupture of the pulmonary alveoli with air beneath the pleura, but no emphysema of the cellular tissues.

With the deep inspiration accompanying labor pains, a large volume of air is stored in the lungs; the chest is fixed and the thoracic cavity narrowed; the force will act then entirely on the contained organs and the parenchyma, which normally meets no resistance, will give way. If the force continues to act, the air passes under the pleura to the root of the lung, opening an easy path through the sheaths of the great vessels, infiltrating the mediastinum and following the vessels of the trachea into the neck, from where, with but little resistance, it finds its way through the cellular tissues. Pneumothorax has not been observed in any case. Nicaise showed that, during loud cries, the trachea dilates almost to the point of rupture, and believes this to be the essential lesion. Notwithstanding the cartilaginous strength of the trachea, posterior hernia of its mucosa has been observed, and rupture of the trachea with subsequent emphysema has been seen in whooping-cough.

Watson had no difficulty in infiltrating the submucous tissues of the face, neck and chest and the submucous tissue of the mouth and throat by the injection of air through a wound of the buccal mucosa.

The ease with which fractures of the lacrimal bone takes place, and its not uncommon occurrence with only slight effort, has led some observers to believe that the point of rupture is here or along the course of the tear duct. Although rupture of the air passages anywhere would permit the air to ascend, there is much anatomic evidence to show that air enters the tissues in this way in conditions other than parturition—and from very slight effort.

Diagnosis offers no difficulties. Swelling which at first may be mistaken for edema shows the characteristic crackling or air crepitation

(*Schneeballknirschen*). Redness, cyanosis or pallor are infrequently present. Appearing first in the neck or face, spreading to the chest and back, often the arms, and less frequently the abdomen and entire body, the patient presents a typical, often grotesque appearance. There is more or less discomfort or pain in the affected area, and occasionally the patient has felt something burst or tear in the neck. Dysphagia, hoarseness and aphonia have been observed. Cough and dyspnea are common and occasionally the patient's cardiac and respiratory distress are alarming. Acceleration of the pulse is common, but one case showed marked bradycardia. Mediastinal emphysema may be demonstrated.

Treatment is expectant. Rapid delivery, however, is indicated for steadily spreading emphysema, or symptoms of respiratory distress.

SUMMARY

1. Subcutaneous emphysema is a broad term for a rare complication of labor which needs further classification.

2. Respiratory emphysema of labor is suggested as descriptive of the form studied here.

3. Its etiology and pathology are not definitely known, but it may originate in any part of the air passages.

4. Its prognosis is generally good, and its treatment obvious.

5. One hundred and thirty cases are now available for study and the appended bibliography, with the abstracted cases above, includes all the references except textbooks.

REFERENCES

Angelici: Arch. di med. chir. ed ig., Roma. 1871, iii, 321. *Champneys:* Med. Chir. Tr., 1882, 75-86. *Champneys:* Med. Chir. Tr., 1885, lxviii, 37-68; Proc. Roy. Med. and Chir. Soc., 1882-5, 284-288, (Abs.); Brit. Med. Jour., 1884, ii, 963, (Abs.). *Detre, G. and Maheu:* Bull. et mém. Soc. de radiol. med. de Par., 1914, vi, 171. *Fabre and Tullat:* Zentralbl. f. Gynäk., 1908, xxxii, 1148. *Hergott, A.:* Clin., 1904, xviii, 986-991. *Hergott, A.:* Rev. med. de l'est, 1904, xxxvi, 685-693; also 303. *Kosmak, G. W.:* Bull. Lying-In Hosp., N. Y., 1906-7, iii, 76-88. *Kosmak, G. W.:* Surg., Gynec. and Obst., 1925, xl, 434. *Kreuzfuchs, S.:* Wien. klin. Wchnschr., 1919, xxxii, 635. *Kushnir, M.:* Vrach. Gaz., 1913, xx, 640. *Lohlein, H.:* Ztschr. f. Geburtsh. u. Frauenkr., 1875, i, 261-272. *Marchand, F.:* Vrtljschr. f. d. prakt, Heilk., 1876, cxxxi, 27-99. *McClintock:* Dublin Quart. Jour. Med. Sc., 1857, xxiv, 450. *Nicaise, E.:* Rev. de chir., 1896, xvi, 538-548. Also, transl. (Abs.): Times and Reg., Phila. and Bost., 1896, xxxii, 247. *Nicaise, E.:* Bull. de la Acad. de med., Paris, 1896, xxxv, 606. *Orth, J.:* Berl. klin. Wchnschr., 1919, xxxii, 635. *Phillips, J.:* Lancet, 1914, ii, 769. *Roche, L.:* Bull. Soc. anat. de Paris, 1859, xxxiv, 252. *Rohrer:* Münch. med. Wchnschr., 1916, ii, 1222. *Sprague, F. H.:* Lancet, 1905, ii, 1430. *Tendeloo:* Verhandl. d. Gesllsch. d. Natur f. u. Arzte, 1907, 260-288. *Vriese:* Verhandl. v. h. Genootsch t. Revord Amst., 1841. *Watson, D.:* Brit. Med. Jour., 1885, p. 699. *Watson, D.:* Lancet, 1905, ii, 1360. Also p. 1505. *Wecker and Landoit:* Traite complet d'ophthalmologie, 1880, i, 35-36. *Williams, J.:* Obst. Jour. Great Brit. and Ireland, 1878-9, vi, 93.

256 JEFFERSON AVENUE.

(For discussion, see p. 681.)

AN OFFICE OBSTETRIC CARD*

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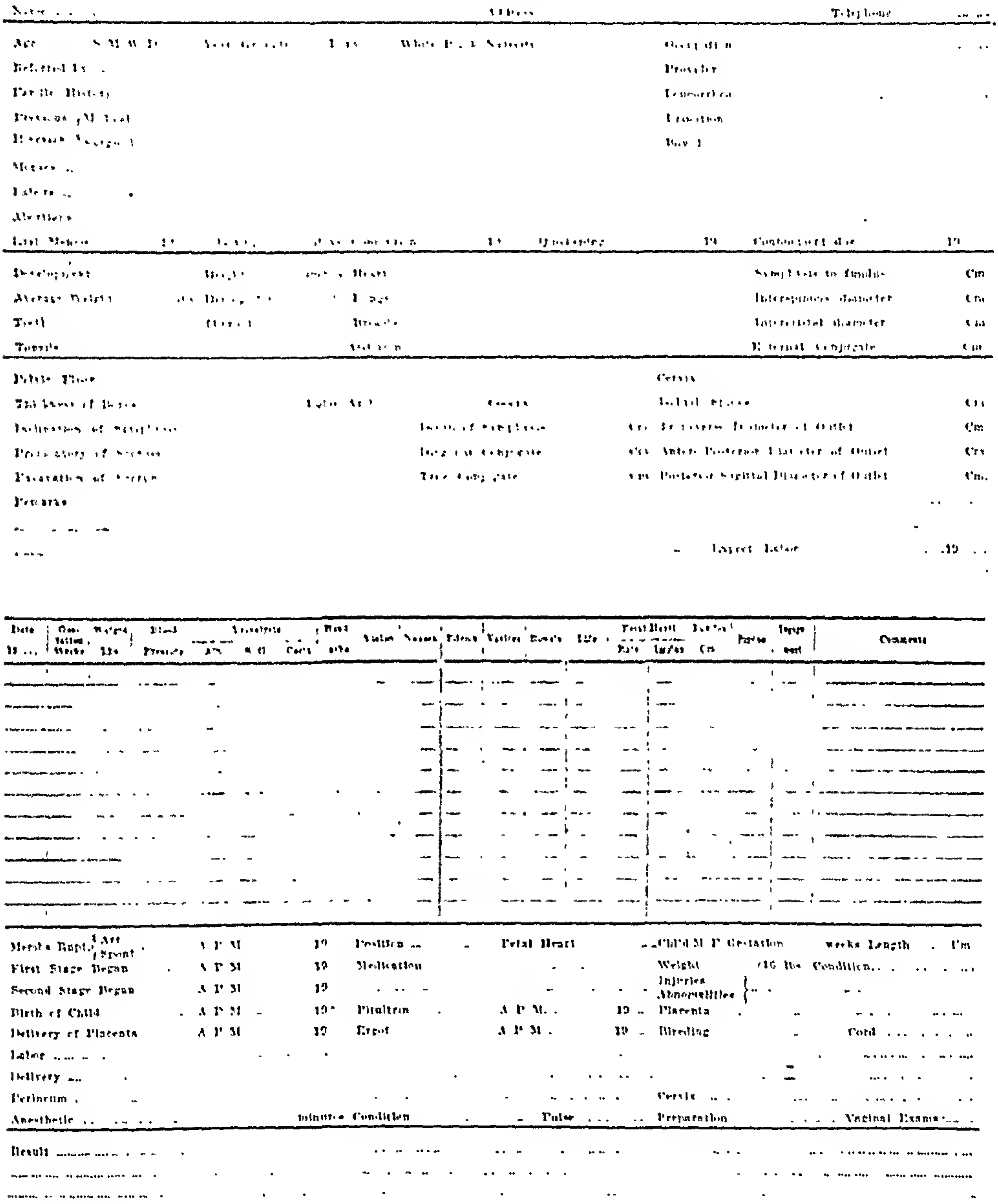
THE obstetric card reproduced below is the result of an attempt to give concisely all the essential facts of an obstetric case on a card small enough to be carried in the pocket. It seems to adequately suit our needs and it is hoped that it may also suit the needs of a few or possibly many practitioners of obstetrics.



Memb's Rupt. Art / Spont A P M 19 Position Fetal Heart Child M F Gestation weeks Length Cm
First Stage Began A P M 19 Medication Weight /16 lbs Condition
Second Stage Began A P M 19 Injuries / Abnormalities
Birth of Child A P M 19 Pituitrin A P M. 19 Placenta
Delivery of Placenta A P M 19 Ergot A P M. 19 Bleeding Cord
Labor
Delivery
Perineum Cervix
Anesthetic Minutes Condition Pulse Preparation Vaginal Exams
Result

The card has been arranged with a view toward saving as much time and writing as possible and yet allowing for the varying requirements of individual cases. The space, "Remarks," is intended for the continuation of the description of any item of the history or examination which cannot be completed in its allotted space as well as for special items and a conclusion in regard to the general condition, type of pelvis, and prognosis. There is no attempt made to allow for detailed descriptions of the puerperal and neonatal periods as they seem to us to be unnecessary, particularly for hospital deliveries. The space, "Result," however, is intended for the mention of any particular event or abnormality of either the puerperal or neonatal period as well as for noting the condition of the mother and baby on discharge.

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*This card may be obtained at the Standard Printing Company, Hannibal, Mo. It measures 5 by 8 inches.

PROPHYLACTIC EXTERNAL VERSION*

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PROPHYLACTIC external version, which may be defined as the conversion of a less favorable into a more favorable presentation by external manipulation, is a much neglected phase of prenatal care. Considering its importance, there has been comparatively little written on the subject. The contributions in the literature are mainly from French, German, and Dutch sources; some few articles have been published by English, Cuban, and American writers.

The procedure is highly recommended by the majority of authors. Objections are offered by Miller[1] on the ground that cephalic version in the last two months of pregnancy is a trying and unsatisfactory procedure; that anesthesia is usually necessary; that there is grave danger of precipitating premature labor and premature separation of the placenta, and finally that there is no place for cephalic version since breech deliveries are so easily handled and are of so little danger to mother and child. Percy[2] believes that the cases in which the operation can be made a practical aid are very infrequent. Marx[3] states that there is only an extremely limited field open to external version. As will be seen from the available statistics and the results obtained in the cases here reported, the above objections cannot be sustained.

The history of external version dates back to the publication of an article by Wigand in the Hamburg Magazine in 1807, emphasizing the many advantages of the procedure. According to Meyer,[4] however, Wigand limited its application to oblique and transverse presentations, and the credit for extending the indication to breech presentation belongs to the French obstetrician, Mattei. Pinard did much to popularize the operation in France. Modern textbooks on obstetries, while recognizing the value of the maneuver, apparently do not emphasize its importance as a part of prenatal care, and as a factor in reducing fetal mortality and morbidity.

Prophylactic external version usually refers to the conversion of a breech or transverse into a cephalic presentation. Kraus[5] uses the term in the opposite sense, and in cases presenting pelvic contraction he converts the cephalic into a breech presentation, thereby hoping to deliver the aftercoming head easier than the forecoming. He quotes Schauta, Bumm, and Wolf in support of the use of the term in this sense. The use of the procedure in this way is not generally sanctioned.

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*Read, by invitation, at the Fifty-second Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 23-25, 1927.

The importance of external version lies in the fact that by means of this simple maneuver, the great majority of breech presentations may be eliminated, thus preventing the high fetal mortality and morbidity resulting from breech deliveries.

It is now recognized that the trauma incident to the supposed necessary rapid extraction causes far greater fetal mortality and morbidity than asphyxia.

Pierson[6] found that natal or neonatal death occurred in 18, or 12 per cent, of 142 primary breech deliveries, while in a series of 87 version and breech deliveries of viable babies, natal or neonatal death occurred in 18, or 26 per cent. In these 36 cases, spinal cord hemorrhage was noted in 17, or 47 per cent; fractured vertebrae in 14, or 38 per cent; intracranial hemorrhage in 44 per cent; hemorrhage in the spinal canal in 47 per cent; complete rupture of the spinal cord in two cases, and partial rupture in two cases. Trauma was the probable cause of death in 50 per cent of the 36 cases; asphyxia alone in 5 per cent; trauma and asphyxia together in 39 per cent. Fifty per cent of the mothers were primiparae. Pierson quotes similar and convincing reports from other authors.

If we accept 3 per cent as the average incidence and 10 to 15 per cent as a conservative estimate of the fetal mortality of viable breech deliveries, as compared to 2 or 3 per cent in cephalic deliveries, the importance of preventing breech presentations is at once appreciated.

From the standpoint of the mother, the tendency to longer labor, premature rupture of the membranes and increased cervical and perineal lacerations is further reason for preventing breech deliveries. Finally, the physician is spared the increased responsibility and time involved in the conduct of breech deliveries.

The subject of external version should be considered from the standpoint of its indications and contraindications, the stage of pregnancy during which it is advisable to be used; the objections or possible dangers to mother and baby; the technic and finally the results obtained, based on the available statistics.

J. Rietdijk[7] reports 356 attempted external versions in 372 cases diagnosed as breech presentations, occurring in the Rotterdam School of Midwifery from 1907 to 1916. Version was successful in 317 cases of which 271 cases were delivered in the clinic. The presentation at birth was cephalic in all but two of these. Of the 39 failures, 25 were confined in the clinic; the presentation was cephalic in 11, and breech in 14 of these cases. Of the 11 cephalic presentations, 8 were turned before the thirty-second week and 3 from the thirty-second to the thirty-eighth week. All breech presentations failing to be turned after the thirty-sixth week, remained breech. Two breech deliveries occurred even though the version had been successful. In each of 3 cases, version was required three times before the presentation remained cephalic. There were 12 neonatal deaths, none of which could be definitely attributed to the preceding external version. Prolapse of the cord occurred in two cases, in both of which the pelvis was flat. There were 28 premature births, all adequately explained by induction of labor for various reasons. Analysis of results according to the stage of pregnancy showed:

8 failures in 102 external versions attempted before the 32nd week
5 failures in 135 external versions attempted from 32nd to 36th week
1 failure in 33 external versions attempted from 36th to 38th week
11 failures in 21 external versions attempted after the 38th week

He concludes that external versions are usually unnecessary before the thirty-second week, but should be done before the thirty-eighth week.

Meurer, in the discussion of the above paper, reports 149 breech presentations, 138 of which he turned successfully and delivered in cephalic presentation.

Kouwer[8] reports 190 attempted external versions from the Utrecht Clinic from 1911 to 1919, of which 174 were successful. Version was impossible in 15 cases, in all of which the baby was nevertheless delivered in cephalic presentation. There was one failure on account of a mistake in diagnosis. Seven babies were born dead, deaths being due to well-established causes in all except one. He strongly recommends the Trendelenburg position as an aid in performing external version and states that success may be had by this method, where version in the horizontal position fails.

Meyer[4] reports 22 cases of breech presentation, successfully corrected by external version. In 8 of these, the version was done in the last week of pregnancy. One baby died due to difficult forceps delivery through a narrow pelvis. Otherwise the version was of no harm to the child. There was no case of prolapse of the cord. He describes the technic employed by Wigand, Schrader, and Hegar as essentially that of disengaging and raising the breech to one side with one, or both hands, if necessary, while the head is then pushed down toward the pelvis on the opposite side with the other hand. He quotes Southwick as disengaging the breech by two fingers inserted in the vagina, pressing the breech up and to one side through the vaginal fornix. This position is retained by the other hand externally after which the version may be accomplished as above described. There are some cases in which external version is impossible without anesthesia. In the Rostock Clinic it is the rule to do an external version each time a breech presentation is found, regardless of the stage of pregnancy. The result is that breech deliveries are very infrequent. Meyer advises the use of pads bandaged on each side of the abdomen to retain the corrected presentation.

Decugniere[9] recommends the Trendelenburg position as a valuable aid in performing external version, and asserts that many cases can be turned after failure by version attempted in the horizontal position. He credits Frühinholz as being the first to suggest the value of the Trendelenburg position in external version (1904); Levy-Solal,[10] De Lee[26] and Pollock[11] have further emphasized its value. Decugniere divides the technic into three steps: (1) mobilization of the breech by carrying the fingers under the breech and slipping it into the iliac fossa corresponding to the side of the fetal back; (2) mobilizing the head which usually becomes accessible from under the ribs following the movement of the breech, and (3) turning the fetus in the direction which will correspond to flexion. The new position is maintained by means of pads and bandage. He recommends that version be practiced not earlier than the end of the eighth or the beginning of the ninth month. It is always a useless procedure before the eighth month. In a total of 61 versions accomplished in the Trendelenburg position, analysis of his results showed 7 failures, but 3 of these were successful on a subsequent attempt. There was a recurrence of breech presentation in 7 cases, 5 of which were multiparae. Analysis of his results with the use of abdominal pads and bandages to maintain the corrected position after version, showed 11 failures in 40 cases. This proportion of recurrence is fully as great as without the bandage, hence the latter is apparently of no advantage in preventing a return to breech presentation after successful version.

Labhardt[12] reports 63, or 35 per cent, successful external versions performed in 185 cases of transverse presentation in the Woman's Hospital, Basel, from April, 1901 to October, 1908. The operation can be done even if the membranes have recently ruptured. The great majority of the patients were multiparae. Prolapse of the cord occurred five times. Forty-four were at term, 19 were premature; 51 versions were cephalic and 12 podalic. The fetal mortality was 6 per cent which is much more favorable than that reported for internal version.

Queirel[13] also compares internal and external version in the treatment of transverse presentation. In 109 cases of internal version, there were 43 living and 66 dead babies, and four mothers died of uterine rupture. In 18 cases of external version there were 16 living and 2 dead babies. Hence, external version should be used in transverse presentation if possible. External version in breech presentations should be undertaken from the beginning of the eighth month. The corrected position may be maintained by a bandage during pregnancy or by rupture of the membranes at the beginning of labor.

Levy-Solal[10] reports 3 cases turned by the aid of the Trendelenburg position. Potocki, in the discussion of this report, states that when the head will not go down by the shorter way, it may sometimes be made to go down on the opposite side, a point which was found of value in the series of cases here reported.

De Bustamente's[14] technic is very similar to that previously mentioned. He believes external version is unnecessary earlier than the beginning of the eighth month in primiparae and the end of the eighth month in multiparae. It can be done at the beginning of labor in some cases. A podalic external version may be done in case of placenta previa in order to place a foot within reach over the cervix. Hannes[15] does not favor external version for placenta previa.

Kitzing[16] favors external version for transverse and breech presentations during the last few weeks of pregnancy and early in labor, but states that the new position must be maintained with a binder and properly fitting pads. Gardner[17] states: "The difficulties of the operation have been exaggerated and its advantages, especially those to the child, have been belittled." Horn[18] says: "The neglect of cephalic version is typical of the history of medicine, in which discoveries are made popular, are for a time forgotten and are then resurrected and their proper limitations established." He attempted external version in 23 cases of which 20, or 87 per cent, were successful and 3 cases unsuccessful. Version was repeated in some cases.

Brodhead[19] believes there is but one danger in external version,—that of prolapse of the cord. The advantages far outweigh the disadvantages. The head should be pushed down on the side opposite that on which the back rests, flexion of the head being preserved in this way. The child can then be kept in the correct position with pads and binder.

Pollock[11] reports 16 successful cases, the version being done from the twenty-eighth week to the thirty-eighth week. Chloroform anesthesia was necessary in 7 cases. Roland[20] discusses the indications and contraindications to external version and states that the most favorable time is at the beginning of the ninth month at which stage the fetus is still sufficiently movable and the new position more stable. Loviot[21] suggests that a left cephalic presentation may be changed to a right, by an intermediate transformation to breech presentation,—in other words, a double external version. It is doubtful if *many* would subscribe to this unnecessary and excessive turning.

Grad,[22] in concluding a report of a case of successful external version states: "If we make attempts in these cases, to do version and carefully watch them

TABLE I

ATTEMPTED EXTERNAL VERSIONS

CASE	PARA	FIRST ATTEMPT	SECOND ATTEMPT	THIRD ATTEMPT	FOURTH ATTEMPT	POSITION IN LABOR
1	0	Failure; 8¾ mo.	Failure; 8½ mo.	Failure; 8¾ mo.		S. L. A.
2	0	Failure; 8¾ mo.				S. L. A.
3	0	Success; 8½ mo.				R. O. A.
4	2	Failure; 8½ mo.	Failure; 8¾ mo.			S. L. A.
5	0	Failure; 9 mo.	Failure; 9 mo.			S. L. A.
6	0	Failure; 8 mo.	Success; 8¾ mo.			O. L. A.
7	0	Success; 8 mo.				O. L. A.
8	2	Success; 7 mo.				O. L. A.
9	0	Failure; 7½ mo.	Spont.; 8 mo.			O. L. A.
10	1	Success; 7½ mo.	Success; 8½ mo.	Success; 8¾ mo.		O. L. A.
11	3	Failure; 7½ mo.	Failure; 8 mo.	Failure; 8½ mo.		S. L. A.
12	0	Failure; 6¾ mo.	Success; 7 mo.			O. L. A.
13	1	Success; 7 mo.				O. L. A.
14	1	Success; 7 mo.				O. L. A.
15	2	Success; 7 mo.	Success; 7½ mo.	Success; 8 mo.	Spont.; 8¼ mo.	R. O. A.
16	2	Success; 6½ mo.				R. O. A.
17	3	Success; 8½ mo.				O. L. A.
18	1	Success; 7½ mo.				O. L. P.
19	3	Success; 8 mo.				O. L. A.
20	0	Failure; 7¼ mo.	Spont.; 7¾ mo.			O. L. A.
21	1	Success; 7½ mo.				O. L. A.
22	0	Success; 8 mo.				O. L. A.
23	1	Success; 6¾ mo.	Success; 7 mo.	Success; 8 mo.		R. O. A.
24	0	Success; 6¾ mo.				O. L. P.
25	1	Failure; 6½ mo.	Spont.; 7½ mo.			O. L. A.
26	1	Success; 7½ mo.				O. L. A.
27	2	Success; 6¾ mo.				R. O. P.

TABLE I—Cont'd.

ATTEMPTED EXTERNAL VERSIONS

CASE	PARA	FIRST ATTEMPT	SECOND ATTEMPT	THIRD ATTEMPT	FOURTH ATTEMPT	POSITION IN LABOR
28	0	Failure; 7¾ mo.	8 mo.	Failure; 8¼ mo.	Failure; 8½ and 9 mo.	R. S. A.
29	0	Failure; 6¾ mo.	Spont.; 7¼ mo.	Success; 7½ mo.		O. L. A.
30	4	Success; 6 mo.	Failure;			O. L. A.
31	1	Failure; 6½ mo.	Spont.; 7 mo.			O. L. A.
32	0	Success; 6¾ mo.				O. L. P.
33	1	Success; 7 mo.				S. L. A.
34	1	Success; 7 mo.	Success; 7¾ mo.			O. L. P.
35	1	Success; 7 mo.				R. O. A.
36	1	Success; 6¾ mo.				O. L. A.
37	2	Success; 8 mo.				R. O. A.
38	1	Success; 7 mo.				O. L. A.
39	0	Success; 8¾ mo.				O. L. P.
40	0	Success; 9 mo.				O. L. A.
41	0	Success; 7 mo.				R. O. P.
42	0	Success; 7 mo.				R. O. P.
43	1	Success; 7 mo.				R. O. A.
44	1	Failure; 7 mo.	Spont.; 7½ mo.			R. O. A.
45	0	Success; 7 mo.				O. L. A.
46	0	Failure; 7 mo.	Failure; 7½ mo.	Failure; 8 mo.		O. L. P.
47	0	Success; 7¼ mo.				O. L. A.
48	2	Success; 7¾ mo.				O. L. A.
49	0	Success; 7 mo.				O. L. A.
50	0	Success; 7 mo.	Success; 7¾ mo.	Success; 8¼ mo.		O. L. A.
51	0	Success; 7 mo.	Success; 7½ mo.			O. L. A.
52	2	Success; 7¼ mo.				R. O. P.
53	1	Success; 7 mo.				O. L. A.
54	0	Success; 8 mo.	Success; 9 mo.			R. O. A.

month after month, in a certain number of cases we can accomplish it with very good results as far as the life of the baby is concerned.''

King[23] describes a postural method of correcting transverse presentation, which depends on the pressure of the thighs on the fetus when the patient is made to assume a squatting posture.

Starke[24] reports a case of successful external version and in conclusion states: "I would recommend to all medical men having the advancement of their profession at heart, in all doubtful cases and when possible, to examine their pregnant patients a week or so before their expected confinement, for the ascertaining and correction of presentations, the same as we recommend to examine their urine for albumin to prevent complications."

Ryder[25] reports that 30 women on whom external version was performed in none of the primiparae did the fetus turn back to its original position; although this did occur in several of the multiparae, and necessitated another version. Several external versions were done under ether anesthesia. There was no injury to the mother in any case. One patient had slight bleeding following the version. There were four failures. The technic employed was essentially that of the authors previously mentioned. He does not regard bandages as of sufficient value to be used. There were 5 cases in which the cord was found around the neck.

In the series here reported from my practice there were 54 patients who were found to have breech presentation on one or more examinations made from the end of the seventh month to full term. These 54 cases occurred in 455 consecutive patients, excluding those having a condition which contraindicated external version. Table I is a brief summary of each case.

There were 81 attempted external versions in the 54 cases. The first attempt was successful in 49 cases; 4 were turned after one or more attempts, making 53, or approximately two-thirds successful versions, and 28, or approximately one-third failures. However, in 6 of the 28 failures, the baby turned spontaneously before reaching full term.

There were 7 cases delivered as breech. Based on the average incidence, there should be approximately 15 breech presentations in a series of 455 deliveries, hence the frequency was reduced 50 per cent by external version. This is in the series as a whole. It will be noted that most of the breech deliveries occurred in the first part of the series. If we consider the results obtained after more experience with the method, it is found that during the past three years, of 37 cases of breech presentation from the stage of viability on to full term, there were only 2 delivered as breech. One of these (Case 33) was a premature delivery, the version having been successful at seven months, but the baby returning to breech presentation just before labor came on at eight months. On account of the interval between the attempted version and the labor, it is doubtful whether the version was a causative factor. The other (Case 28) could not be turned even under anesthesia, apparently because of the fact that two previous attacks of suppurative appendicitis had produced a very large, dense scar in the lower right quadrant, which greatly interfered with palpation. On the basis of 345 full-term deliveries during this period, one would expect at least 10 breech deliveries; hence the frequency of breech delivery was reduced 80 per cent.

Analysis, according to the month in which version was attempted or spontaneous, showed one case in the sixth month which was successful; 29 cases in the seventh month, of which 76 per cent were successful, 20 per cent failed, and 4 per cent turned spontaneously; 34 cases in the eighth month, of which 62 per cent were successful, 23 per cent failed, and 15 per cent turned spontaneously; 24 cases in the ninth month, of which 46 per cent were successful, 50 per cent failed, and 4 per cent turned spontaneously. The low percentage of spontaneous versions and high percentage of failures in the seventh month are probably due to the fact that the routine abdominal examinations were not begun until near the end of the seventh month. It is apparent, therefore, that external version is successful in 76 per cent of the attempts made in the seventh, 62 per cent in the eighth, and 46 per cent in the ninth month. The version is ultimately successful, however, if repeated attempts are made, as is evident by the great reduction in the frequency of breech deliveries. The frequency of spontaneous version decreases rapidly as the patient approaches full term.

The cases were also analyzed according to parity. There were 25 primiparae and 29 multiparae. Version was successful in 23 of 42 attempts, or 53 per cent, in primiparae. It was necessary to repeat the version in 4 of these cases. There were 3 cases of spontaneous version in the 19 failures. Version was successful in 31 of 39 attempts, or 80 per cent, in multiparae. It was necessary to repeat version in 4 of these cases. There were 5 spontaneous versions in the 8 failures.

One version was sufficient in the majority of cases. In 3 cases version was performed twice, and in 4 cases, three of these being multiparae, it was performed three times.

Spontaneous version often occurs after failure to perform external version. There were two cases of spontaneous version in the seventh month, one a primipara and one a multipara. This number would probably have been much greater, had not the observations been limited to the latter part of the seventh month. There were 5 cases in the eighth month, of which 3 were primiparae and 2 multiparae. There were no cases in the ninth month.

In addition to the points in the technic previously mentioned, note was made as to whether the baby was turned in the direction of the forehead (flexion) or the occiput (extension) as the advancing part. In 3 cases the initial attempt to turn the baby in the direction of the occiput was successful. In 5 cases this method was successful where the initial attempt in the direction of the forehead had failed. In 25 cases the initial attempt to turn the baby in the direction of the forehead was successful. In 8 cases this method was successful where the initial attempt in the direction of the occiput had failed. In 12 cases both methods failed. Even though turning is done in a direction which favors extension, there is no tendency for extension to complicate labor, which has heretofore been emphasized as a possible danger. Turning in this direction is less often successful than in the reverse direction, probably due to the fact that tendency to extension of the lower limbs is favored. The Trendelenburg position was not used in any case in this series.

Ether anesthesia was used in two cases in which version failed several times. In Case 28, it was impossible to turn the baby, even with the aid of two fingers in the vagina pressing the breech up and to one side through the vaginal fornix. The excessive scar tissue in the lower right abdomen apparently was the obstacle in this case. In Case 46, the turning was easily accomplished under the anesthetic.

Case 50 was of more than ordinary interest. This patient showed typical uterus didelphys, with complete duplication of the uterus, cervix, and vagina. The pregnancy was in the uterus on the right, the other uterus being moderately enlarged and lying somewhat to the left and posterior. External version was of great aid in preserving a cephalic presentation and determining whether the head would pass the obstruction offered by the nonpregnant uterus. The test was much safer with a forecoming than with an aftercoming head.

There was very little discomfort during or after the version. Bleeding did not occur in any case, and there was no prolapse of the cord or small parts. Coiling of the cord about the neck was noted in 40 per cent of the cases of attempted versions and in 37 per cent of the other cases, delivered over this same period. There was no fetal mortality in the series, and no premature rupture of the membranes or premature separation of the placenta. There was no case of premature labor which could be attributed to the version.

No attempt was made to retain the corrected position by abdominal pads and bandages. Analysis of statistics, previously mentioned, shows that fully as many babies revert to breech presentation with, as without, the use of the bandage.

SUMMARY

The principal indication for prophylactic external version is the discovery of a breech or transverse presentation during the latter part of pregnancy. According to some authors, it is indicated in placenta previa in order to make the foot more accessible for controlling the hemorrhage.

The contraindications to external version upon which most authors agree are multiple pregnancy, marked pelvic contraction, dead fetus, previous cesarean scar, threatened uterine rupture, hydramnios, oligohydramnios, premature separation of the placenta, and the onset of labor. Other conditions which may contraindicate external version are placenta previa, bicornuate uterus, and eclampsia.

The objections to external version and possible dangers associated with it, are that improper version may be done through a mistake in diagnosis, thus converting a cephalic into a breech presentation; prolapse of the cord or small parts may occur; the cord may become coiled about the neck more frequently; the uterus may rupture; the membranes may rupture prematurely; premature delivery may be brought on; the position is not permanent; the operation is difficult; breech deliveries present no serious danger or difficulty; and finally, separation of the placenta may occur. The statistics and results bearing on these points, both from other authors and from the series of cases reported, do not sustain these objections.

The most favorable stage of pregnancy to attempt external version is during the eighth month. From the end of the seventh month, on to full term, abdominal examinations should be made at least every two weeks to discover breech or transverse presentations and convert them to cephalic by external version. If repeated attempts are unsuccessful, the version can usually be done under anesthesia. The turning is increasingly difficult as full term approaches, more so in primiparae than in multiparae.

The essential points in the technic are to raise the patient's head and shoulders somewhat and flex the thighs in order to obtain as much relaxation of the abdominal muscles as possible; the bladder should be emptied; all manipulations should be carried out as gently as possible, and there must be an accurate preliminary diagnosis of the presentation and position. The breech is first raised from the pelvis, with both hands if necessary, and carried toward the iliac fossa on the side opposite to that on which the head is to be brought down; the head is then pushed down toward the pelvis with one hand while the breech is pushed up toward the fundus with the other hand by very gradual, intermittent pressure. As a rule, it will be found easier to make the forehead advance, rather than the occiput. If the breech is fixed in the pelvis, it may be disengaged by the aid of the Trendelenburg position or by pressure with two fingers inserted in the vagina. It is not necessary to use a bandage to attempt to retain the corrected presentation, as even with the bandage, the version may have to be repeated one or more times before labor.

The results of routine external version in the last two months of pregnancy show that it is a harmless procedure for both mother and baby, and by means of this simple maneuver from 80 to 90 per cent of breech presentations may be prevented with a corresponding reduction in the fetal mortality and morbidity which attend breech deliveries.

CONCLUSIONS

1. Breech deliveries should be prevented on account of the resulting increase in fetal mortality and morbidity.

2. The frequency of breech deliveries may be reduced from 80 to 90 per cent by the routine practice of external version during the last two months of pregnancy. Anesthesia is rarely necessary.

3. External version has no apparent harmful effect on the mother or baby during pregnancy or labor.

4. The turning is usually easy to perform and may be tried either in the direction of flexion or extension of the fetus, the former, as a rule, being more successful.

5. The version may have to be repeated one or more times before the presentation remains cephalic. Abdominal pads and bandages are apparently of little value in preventing a return to breech presentation.

6. External version should be given greater emphasis as an essential part of prenatal care.

REFERENCES

(1) *Miller, H. E.:* Am. Jour. Obst. and Gynec., *1925, x, 241.* (2) *Percy, J. F.:* Am. Jour. Obst., *1900, xlii, 44-51.* (3) *Marx, S.:* Med. Record, 1901, lix, 692-694. (4) *Meyer, K.:* Die Behandlung der Becken-endlagen durch die äussere Wendung, Rostock, 1907. (5) *Kraus, E.:* Ztschr. f. Geburtsh. u. Gynäk., 1905, lvi, 190-203. (6) *Pierson, R. N.:* Surg., Gynec. and Obst., 1923, xxxvii, 802. (7) *Rietdijk, J.:* Med. Weekbl., 1917-18, xxiv, 344-351. (8) *Kouwer, B. J.:* Nederl. Tijdschr. v. Verlosk. en Gynaec., 1923, xxix, 73-81. (9) *Decugniere, (Marcel):* La Version par Manouvres externes, en *Position* de Trendelenburg dans les Presentations due Siege. *Paris, 1923, p. 47.* (10) *Levy-Solal, E.:* Bull. Soc. d'obst. et de gynéc. de Paris, 1922, xi, 20-23. (11) *Pollock, W. R.:* Tr. Obst. Soc. Lond., (1906) 1907, xlviii, 319-330. (12) *Labhardt, A.:* München. med. Wchnschr., 1909, lvi, 66-77. (13) *Queirel:* Marseille méd., 1903, xl, 65-74. (14) *De Bustamente, A. S.:* Rev. méd. Cub., 1923, xxxiv, 881-888. (15) *Hannes, W.:* Zentralbl. f. Gynäk., 1925, xxxix, No. 39, p. 683-698. (16) *Kitzing, F. F.:* Illinois Med. Jour., 1914, xxv, 335. (17) *Gardner, W. S.:* Jour. Alumni Assn. Coll. Phys. and Surg., 1899-1900, ii, 8-13. *(18) Horn, F.:* Obstetrics, 1900, ii, 551-569. (19) *Brodhead, G. L.:* Post-graduate, 1901, xvi, 889-903. (20) *Roland:* Poitou méd., 1906, xx, 73-76. (21) *Loviot:* Bull. et mém. Soc. obst. et gynéc., 1888, iv, 155-164. (22) *Grad, H.:* Am. Jour. Obst., 1907, lv, 425. (23) *King, A. F. A.:* Am. Jour. Obst., 1907, lv, 826-831. (24) *Starke, G.:* Med. Record, 1894, xlvi, 733. (25) *Ryder, G. H.:* Surg., Gynec. and Obst., 1923, xxxvii, 660-664. (26) *DeLee:* Principles and Practice of Obstetrics, *Philadelphia,* ed. 4, 1924, W. B. Saunders Co.

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CLINICAL SIGNS OF FETAL DISTRESS DURING LABOR*

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THIS study, begun about two years ago, was undertaken to determine what relationship exists between changes in the fetal heart sounds and threatened asphyxia, especially during the latter part of labor.

The subject proved so interesting and enlightening that I decided to go a little more deeply into the question, and so have incorporated certain historical data concerning the fetal heart sounds and the funic souffle, and also the significance of meconium in the amniotic fluid.

From a careful study of five hundred cases, personally observed at Bellevue Hospital and the Manhattan Maternity Hospital, in private practice, and in other institutions, I have selected those in which there was a noticeable deviation from the accepted normal fetal heart rate of from 120 to 160, taken during intervals between uterine contractions. Many cases had to be omitted because of insufficient observation, so that the cases discussed include only those in which complete data was obtained.

In addition to these cases a small number were observed in which no change from the normal fetal heart sounds were noted and yet babies were stillborn or died soon after birth.

Among those cases showing a deviation from the normal heart rate, an attempt was made to show the relationship between the condition of the baby at birth and the frequency of the heart sounds, also positive or negative Wassermann reaction, the type of pelvis, the time of rupture of the membranes, the character of uterine contractions, the length of labor, the presence of the funic souffle, the meconium in the amniotic fluid with these variations. Necropsy reports in cases of stillbirths or neonatal deaths, were compared with the clinical findings wherever possible when examining the fetal heart. The use of an elastic band on the stethoscope is of advantage, and, during the second stage of labor a modification of the DeLee stethoscope, or an ordinary stethoscope with an adjustable head band, is comfortable and convenient. A rubber nipple, with the top cut off, placed over the bell of the stethoscope helps to identify and intensify the heart sounds. Pressure on the stethoscope or changing the axis of the bell eliminates the sound of the uterine souffle. The sounds should be recorded for one-half minute because a slight discrepancy in a ten to fifteen seconds count makes considerable difference in sixty seconds. The fetal heart often starts at a rapid rate during the beginning of an examination, due to the movements of the fetus, or the beginning of a labor pain, therefore, one should not commence to count the beats until they assume their regular character again. Observations of the fetal heart, I believe, are the best criteria we have of the condition of the child in utero, although accurate conclusions are not always possible.

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Very little historical data can be found in the literature until just a few years more than a century ago. In 1818, the fetal heart sounds were first heard by F. I. Mayor, a surgeon practicing in Geneva, but he did not appreciate their importance and his observations did not become widely known. In 1821, Lejumeau de Kergaradec, an obstetrician and an associate of Laennec, also heard the fetal heart beat and the uterine souffle. He used the stethoscope devised by Laennac for the first time. He realized the benefits to be derived from this knowledge and announced his discovery in a memoir presented to the Royal Academy of Science in Paris. Since then many observers have written on the subject. Evory Kennedy, a Master at the Rotunda Hospital, described the various locations where the sounds could best be heard, and in 1833 first described the funic murmur, but he erroneously thought that there was a "sympathy" between the maternal and fetal circulation. A few years later he reported four cases with steady slowing and final cessation of the heart sounds after the administration of ergot. The younger Naegele found that the fetal heart rate was decreased by compression on the cranium of the baby at the time of its passage through a narrow pelvis. He also heard the movements of the fetus at earlier periods in pregnancy than it is possible to hear the fetal heart. Frankhenhaüser found that the age of the fetus caused no difference in the frequency of the pulsations, but that activity of the fetus increased the rate. Killian, of Bonn, said that the most powerful exertions on the part of the mother caused no appreciable acceleration in the rapidity of the fetal heart rate. Hohl's contribution was, that uterine contractions have manifest influence on the fetal heart sounds, and that they are affected by an increased temperature of the mother, but are not affected by venesection, rest and sleep of the mother. Duval, Kelly, Fischel, Valenta and Fleischman each reported that they had been able to palpate the fetal heart beats through the mother's abdomen. In 1875 James Cummings wrote in his treatise on *The Uterine Souffle and the Fetal Heart:* "When sounds that have been distinct and normal become rapid and weak and then can scarcely be recognized, again, when pulsation becomes slower and weaker and may cease altogether, or when they become irregular and intermittent from irritation or pressure on the brain, we may conclude with tolerable certainty that the child's life is in danger." In spite of these observations, no definite conclusions were drawn or laid down concerning the behavior of the fetal heart in its relation to the vital interest of the child until 1893, when Von Winckel expressed himself definitely. He stated that a rise in the rate of the fetal heart sounds above 160, and a fall of the rate below 100, between uterine contractions, were signs of asphyxia, both of which were indications for the termination of labor. Since then Baum, Seitz, P. Esch, E. Sachs, A. Frey, and Zangemeister have made valuable contributions, but they are not in accord as to the clinical significance of changes in the fetal heart sounds. Intrauterine congenital heart disease has been diagnosed by B. H. Stewart, J. J. Sampson and others by observations of fetal heart sounds. Willkonn suggested using chloroform inhalations, six to eight drops per minute, when the fetal heart rate remains below 100, to decrease the tonus of the uterine and abdominal muscles. In two of my cases of failing fetal heart, this was used with success. I feel that further investigations which might tend to a better understanding of this important and practical question would be of value.

What we are accustomed to term the "fetal heart," we regard as the transmission of the sound of the heart beat of the fetus to the ear. The sounds are first heard about the middle of pregnancy, though some observers claim to have heard them as early as the third month. These sounds are transmitted through the body of the fetus, amniotic fluid, the uterine and abdominal walls. As in adults, different hearts vary inherently in rate and are affected by various factors, so it is conceivable that the heart beat of one fetus may differ from that of another, and may be modified by different influences. There is no reason to disbelieve that the vagus influence does not pertain in the fetus as in the adult, and so function as the regulator of contractions of the heart. The quality of the tissue of one heart may differ from that of another, and consequently the sounds will not be uniform in strength and rhythm. The rate of a heart may be influenced by its nerve stimulation and the amount of work it has to do in transmitting the varying column of blood, so it follows that intracranial pressure on the vagus center or excess of carbon dioxide in the blood going to the center will decidedly influence the fetal heart rate. The volume of blood going through the heart may be affected by the freedom of flow through the vessels of the umbilical cord, by the permeability of the placental tissue, or by the force of the contractions of the uterine muscle, influencing the capacity of the sinuses of the uterus.

It is easy to comprehend that, if the contractions of the uterus are prolonged and the intervals shortened, especially after the fetal membranes have ruptured, the capacity of the blood carrying sinuses is restricted.

From the physiology of labor we know that as labor advances, the uterine wall thickens and the cavity of the uterus diminishes in area. This change becomes more marked when the membranes rupture. As a result of this physiologic change, the circulation in the placenta is affected, first, by the thickening of the placenta because of its diminished area of attachment; and second, by the pressure on the placenta made by direct contact of the body of the fetus. Following these changes, there is a gradual slowing of the heart toward the end of labor. In the second stage of labor the slowing becomes more noticeable in many cases because, as the body of the child passes out of the uterine cavity, the placenta more and more becomes secondarily affected by the diminished area of the contracting portion of the uterus. Thus, the oxygen supply to the fetus is limited. Therefore, during the last few minutes before birth of the child the heart rate is often much below 100, but as delivery is imminent, little or no harm comes to the baby. The oxygen supply is also limited when the vessels of the umbilical cord are compressed by the body of the fetus. It follows that vagus irritation is thus indirectly brought about just as readily as when the medulla is compressed by an existing disproportion between the head and the pelvis, or by a faulty position, or by a constricting cervix or vulva. If this direct pressure does not reach the cardiac center in the brain, the heart will function as before, and the sounds will not be influenced. But, if the respiratory center is involved we have no knowledge of it until the child is born with some degree of asphyxia. Just before paralysis of the cardiac center following compression of the medulla, the heart beat may become very rapid.

Kergeradec's investigations showed that the maternal pulse has no influence on the fetal heart. If the maternal pulse is rapid because of fever, the fetal heart rate will be increased. The temperature of the fetus is at least one degree higher than that of the mother, and the heart beat corresponds to the degree of temperature. As in the case of an adult heart, an elevation of blood pressure makes the heart rate less. In the case of a fetus the blood pressure may be affected by pressure upon the placenta, cord or brain. During a uterine contraction the fetal heart becomes slower, and resumes its normal rate when the pain is over.

Many factors influence the intensity of the fetal heart sounds. Among these are the thickness of the abdominal wall, the quantity of liquor amnii, distention of the bladder, gases in the intestines, uterine contractions, abdominal muscle contractions, the situation of the placenta which is a poor conductor of sounds, and the position of the fetus in relation to the abdominal wall.

Labor itself rarely produces modification of the fetal heart sounds up to the moment of rupturing of the membranes, when they are generally louder and clearer and may be heard over a more considerable area.

Molding of the head during labor is a slow process. One diameter increases at the expense of another, without increasing the contents of the cranium. With increased intracranial pressure, bulging of the fontanelles acts as a safety valve. Because of the great flexibility of the skull, the dura and cerebral cortex are poorly protected from pressure. The cranial sinuses may be pushed aside and distorted by molding of the head, and the stasis so produced will bring about edema of the brain tissue. Under such conditions, the fontanelles will no longer compensate for the increase in the cranial contents. If this pressure reaches the vagus center, a slowing of the fetal heart will result. As in an adult, cerebral pressure may either accelerate or slow the heart. Esch was able to produce slowing of the fetal heart beat during pregnancy by sudden firm pressure on the fetal head through the abdominal wall. He also reported slowing of the heart in cases of contracted pelves, in early or in late rupture of the membranes, and in cases in which increased pressure acted on the skull.

It is quite evident from our knowledge of physiology that if ergot or pituitrin is given, and not followed shortly by delivery, asphyxiated babies may result.

Realizing the futility of a statistic or percentage survey I have selected for discussion only cases that seemed to me to have a direct bearing upon the various factors mentioned before, or those from which some points of clinical importance may be gained. I have, therefore, made no attempt to summarize the cases in series.

In the cases observed, slowing of the fetal heart stood out as the sign of most importance. Interference with the circulation in the cord, due to coils around the neck or the body, was not uncommonly observed as a factor in determining the vitality of the child at birth. Prolonged and frequent contractions of the uterus, with membranes ruptured, was also a noticeable cause both with a disproportion and where none existed. Partial separation of the placenta was noted infrequently; multiple fibroids of the uterus were the cause of altered pulse rate in two cases. Rarely did a cerebral hemorrhage produce slowing of the heart.

In every case, as soon as labor pains are well established, routine observations of the fetal heart should be carried out. The rate should be recorded every fifteen minutes in the first stage, and every five minutes or less in the second stage. It is important to observe the fetal heart tones during the first, as well as the second stage of labor, as in some cases, the fetal heart actually ceased during the first stage, and stillborn babies resulted. Auscultatory observations were made before, during and after uterine contractions, at frequent intervals, in both the first and second stages of labor. Counting the heart rate near the middle of the pause between pains gave the most satisfactory information. In cases where the heart falls below 100, and remains there, we must consider that the child is in danger. If this slowing has been gradual the danger to the child is not so acute as in cases where the change has been sudden. Where the fetal heart goes below 100 following a pain, but during the interval recovers its former rate, it is not evidence of fetal distress. A continuous or sudden slowing of the fetal heart to 100 or less is, on the basis of these observations, an indication for the termination of labor, in the interest of the child. In no case should an operative delivery be carried out, if the accepted conditions for such a procedure are not present. In rare cases, where these changes occur during the first stage of labor, a cesarean section may be safer for both the mother and child. By the use of "prophylactic forceps" in the second stage, we can prevent stillbirths in some cases. The longer the use of forceps is deferred the more likely are we to get a severely asphyxiated or stillborn child. It was proved by

E. Frey in a long series of cases that the longer the heart beat slowed down below 100 between pains, the greater the percentage of dead children. Sachs concluded in his work that where the termination of labor is delayed longer than forty minutes after such a slowing down of the heart, the child usually dies. In some cases, the slowing of the fetal heart was transitory and did not recur and nonasphyxiated babies were born spontaneously. This variance may be explained by compression on the cord by a small part. The administration of chloroform, eight to ten drops per minute, for a period of some ten minutes caused the uterus to relax sufficiently in two of my cases for the heart rate to return to normal from a rate well below 100. In one case chloroform was repeated after an interval. In both instances, spontaneous birth of nonasphyxiated babies resulted. One may resort to the use of chloroform in such a manner while preparing for an operative delivery. It was observed in thirty-six cases where the slowing remained below 100 for some time, that sixteen deliveries were operative, and twenty were spontaneous. Twenty-two of the babies were born in good condition, six had some degree of asphyxia and eight fetuses were stillborn.

In this entire study there were only eight cases in which the fetal heart rate was accelerated above 170, and none of these babies were lost. Two were mildly asphyxiated. The causes of the acceleration I attributed to pneumonia in the mother in one, eclampsia in one, unusual activity of the baby in three and unaccounted for in three.

When there was a fluctuation of the heart rate between the normal accepted rate of 120 to 160, the variations were only temporary and did not seem of significance to the welfare of the baby.

In two cases the heart sounds ceased during labor, without warning. The autopsies accounted for the death in one from intrauterine inspiration and the other from asphyxia caused by the cord being coiled four times about the neck and showing a true knot.

Fresh meconium appeared in twenty-one cases of vertex presentation, and there was no change in the fetal heart below the accepted normal. In seven of these cases the cord was coiled about the neck at least once. The membranes ruptured prematurely in twelve of these. All had spontaneous deliveries and live babies.

In thirty-five cases in which the cord murmur was heard during both the first and second stages of labor, it was found to be coiled about the neck at birth in every instance. Three of these cases resulted in stillbirths, in four the babies were severely asphyxiated, but resuscitated, and in ten there was mild asphyxia. In ten others where the cord was loosely around the neck no murmur was heard and asphyxia was not present in any of them.

In no instance did syphilis or a positive Wassermann reaction influence the fetal heart rate unless it was in one case that had had two previous stillbirths. This time the labor was short and the fetal heart was slowed for one hour. A cesarean section was done, but a stillbirth resulted, the autopsy showing cerebral hemorrhage and syphilis. The syphilis may have been a factor in causing the hemorrhage and resultant slowing of the heart.

The length of the first stage of labor rarely showed marked influence in alteration of the fetal heart rate. In cases where there was any alteration there had been, almost invariably, either premature rupture of the membranes or unusually strong pain or a disproportion between the pelvis and the fetus.

The length of the second stage of labor seems to have been a factor in a number of cases, in causing the heart rhythm to depart from the normal.

It was also noted that the heart rate of the baby following birth varied from 60 to 110, but that after the baby cried or moved its arms and legs, the rate increased immediately to between 170 and 220, and at the end of ten minutes decreased again to between 120 and 140. This change occurred within lesser limits when the uterus was vigorously palpated and the movements of the child stimulated before delivery.

When the caput is on the perineum and spasmodic, irregular or regular movements can be seen, asphyxia is present. It is accompanied by a very slow fetal heart. In one of my cases showing this phenomenon, the fetus was severely asphyxiated, and in another it was stillborn. These movements are due to efforts of the fetus to breathe and is a demand for oxygen.

RÉSUMÉ

Fetal heart sounds, being the direct transmission of the sounds from the heart of the fetus, will usually give first hand information of the condition of the fetus, and indicate whether or not the child in utero is broadcasting signals of distress. Careful "listening in" is obligatory to the conscientious obstetrician, and should be done from early in labor until the child is born. This is especially necessary in elderly primiparae, in cases of a "questionable" pelvis, and in cases having frequent strong contractions, or where fetal membranes have ruptured prematurely, and in cases of breech presentation.

A fetal heart remaining below 100 between pains is a very real sign of distress, and either calls for extremely careful observation and investigation, or the termination of labor if this can be done with safety to the mother.

A funic souffle persistently heard, usually indicates a cord around the neck, or pressure on the cord, and is an extremely valuable sign to the observant obstetrician as indicating possible danger to the fetus.

The appearance of meconium is not per se of the vital importance that some suppose, but the presence of meconium with a slowed fetal heart is an added indication for interference.

A rapid fetal heart is usually not of serious import, nor is a fetal heart that fluctuates or varies, provided it is within the usual normal range.

Occasionally, however, a child may be born dead, and the fetal heart show no indication of the impending asphyxia even when carefully observed all during labor. Such deaths are usually due to some form of cerebral injury, involving the respiratory center.

Syphilis has not been found to be a factor in influencing the rate of the fetal heart during labor.

A small pelvis, early rupture of the membranes, or frequent strong uterine contractions have a marked effect in slowing the fetal heart, especially if any of these conditions are combined.

Prolongation of labor during the first stage influences the heart rate of the fetus very little, but during the second stage the effect is much more marked and frequent. Changes in the rate of the fetal heart occur more commonly in the second stage of labor, therefore, more frequent observations during this period are essential.

The administration of chloroform in the manner suggested, while making ready for the delivery, may help save some of these babies.

At birth, the heart rate of the baby becomes quite slow and quickly rises after a few inspirations to gradually return to the usual quickened rate of the newborn child.

Forceps deliveries per se, in competent hands, do not add to the hazard of the baby. On the contrary, in many instances when a changed rate of the fetal heart has warned of danger, a timely and judicious delivery by forceps will enable us to reduce our present persisting ratio of stillborn babies.

REFERENCES

Lejumeau de Kergeradec, N. J. A.: Memoirs sur L'auscultation, etc., Paris, 1822. *Evory Kennedy:* Observations on Obstetric Auscultation, New York, 1843. *H. F. Naegele:* Die Geburtshülfliche Auskultation, Mainz, 1838. *Frankenhaüser:* Monatschr. f. Geburtsh. u. Frauenkrankh., 1860, xv, 354. *W. F. Montgomery:* An Exposition of the Signs and Symptoms of Pregnancy, London, 1837. *Hohl:* Die Geburtshülfliche Auskultation, 1833. *James Cummings:* Edinb., Oliver and Boyd, 1875, 29 pages. *F. von Winckel:* Handb. der Geburtshülfe, 1903, i, 634-643. *P. Baumm (Breslau):* Arch. f. Gynäk., 1917, cvii, 353-366. *P. Esch:* Monatschr. f. Geburtsh. u. Gynäk., June, 1925, lxix, 308-319. *E. Sachs:* Ztschr. f. Geburtsh. u. Gynäk., February, 1920, lxxxii, 284. *A. Frey:* Ztschr. f. Geburtsh. u. Gynäk., December, 1924, lxxxviii, 261-303. *W. Zangemeister:* Zentralbl. f. Gynäk., April, 1926, l, 972-976. *B. H. Stewart:* Brit. Med. Jour., November, 1920, ii, 819. *J. J. Sampson, et al.:* Am. Heart Jour., August, 1926, p. 717. *L. Willkomm:* München. Med. Wchnschr., December, 1925, p. 2188. *R. A. Bartholomew:* Am. Jour. Obst. and Gynec., July, 1925, x, 89-93.

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(For discussion, see p. 681.)

Society Transactions

AMERICAN GYNECOLOGICAL SOCIETY

FIFTY-SECOND ANNUAL MEETING

Hot Springs, Va., May 23, 24 *and* 25, 1927.

The scientific sessions included the following papers with abstracts of the discussions:

DR. REUBEN PETERSON, Ann Arbor, Michigan, read a paper entitled **Transplantation of the Ureters into the Bowel to Secure Sphincteric Urinary Control in Inoperable Vesicovaginal Fistula.** (For original article see page 492, September issue.)

DISCUSSION

DR. J. WESLEY BOVÉE, WASHINGTON, D. C.—In the *Transactions* of this Society for 1900 Dr. Peterson vigorously condemned ureterointestinal grafting. He now reports having performed the operation for inoperable vesicovaginal fistula, to secure sphincteric urine control. Believing as I do, his objections of 1900 to ureteral grafting into the bowel are overwhelmingly valid, I would exhaust nearly every other resource before resorting to that operation. These alternatives for such exaggerated conditions might be closure of the vagina with the creation of a urethra (if it be absent) by tunnelling, as I did in 1917, or other plastic procedure, or utilizing the body of the uterus to plug the fistulous opening in the vesicovaginal septum, or even creating a new bladder sphincter from the pyramidales (Goebell).

The indications for the many recorded grafts of the ureter into the rectum or sigmoid have been exstrophy of the bladder, cystectomy for primary or secondary cancer, tuberculosis, injuries, exaggerated vesicovaginal fistula, etc. Those of grafting this duct into the small intestine or into the cecum or vermiform appendix have been done usually for injuries high in the course or when a considerable amount of the lower part had to be sacrificed. In my judgment, these grafts should not be preferred to grafts into the bladder or into its fellow or substitution of other material for missing parts of a ureter. In the absence of the bladder only grafts of the intestinal type seem indicated.

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Finally, I regard this as a very dangerous operation, having a high primary mortality rate and one very much higher ultimately; one that must be resorted to occasionally but always with great apprehension.

DR. JAMES E. KING, BUFFALO, NEW YORK.—So far as obstetric injuries are concerned, I consider the indications for such a procedure very small. It is perfectly surprising how extensive defects can be closed in one or two sittings by a plastic operation and I should feel that, considering the seriousness of such a procedure as suggested, it would be always desirable to make attempts at plastic closure first.

Some very good statistics in regard to this operative procedure are given by Lower who has had a very considerable experience. He reported 32 cases which were done for the following indications; 15 for exstrophy, 10 for carcinoma, and 7 miscellaneous conditions. Contrary to Dr. Peterson, from his experience, Lower advises the intraperitoneal method as a much safer and better procedure.

So far as the rectal sphincteric control is concerned he gives very splendid reports, anywhere from three or eight hours during the day and perhaps only one or two voidings at night. He emphasizes one thing which it seems to me we must not overlook in considering sphincteric control, and that is the necessity for a certain education, a certain experience, which the patient acquires, which is essential before sphincteric control becomes very efficient.

This procedure offers a possible field in the cases of cancer of the bladder where the victim is suffering day and night with frequent urination. If the technic of this operation can be brought to a point where the procedure will not be attended by a high mortality it may be possible to give those patients from six months to a year of comparative comfort.

Another indication that might develop would be carcinoma of the cervix where the tumor is encroaching upon the ureters.

DR. BROOKE M. ANSPACH, PHILADELPHIA, PA.—There is no doubt that the indication for transplantation of the ureters into the rectum does occasionally arise. My patient had an extensive vesicovaginal fistula that had been operated upon a number of times. There was great loss of tissue and much cicatricial contraction. The ureteral openings were on the borders of the retracted and fixed remains of the vaseovaginal septum. We tried to persuade the patient to have the vagina closed subsequent to the establishment of a permanent communication with the rectum but even after explaining to her the dangers of an alternative operation, she preferred it in order, I think, to continue her marital relations, in deference to the wish of her husband. The implantation of each ureter into the rectum was made on separate occasions, first on the right side. The ureter was divided just above the broad ligament. The technic of Coffey was followed, a small rubber tube being introduced into the ureter and attached there. By this tube the distal end of the ureter was drawn well within the rectum while the distal end of the rubber tube was carried downward through the anus, so that it drained the ureter externally. The patient did very well. At the end of six months the second operation was performed. At that time the right ureter above the point of anastomosis was found to be very much dilated. As this was probably due to contraction of the cut end of the ureter, it appeared desirable to get the entire left ureter with its bladder opening. Accordingly, the uterus was removed in order to give access to the lower part of the ureter, and we succeeded in detaching the entire ureter with its bladder opening, without, however, getting as much of the surrounding bladder mucosa as I would plan to do on another occasion. I transplanted the left ureter into the rectum following the Mayo method of isolating the bowel area with rubber clamps. The ureteral end was kept open with a short rubber tube to the distal end of which a weight was attached to facilitate its detachment later from the ureter and expulsion through the anus.

What I am especially interested in is the fact that although this woman appears to be perfectly well and is very happy with the cessation of the constant flow of urine, works every day and has no bad symptoms, her blood chemistry shows 60 nonprotein nitrogen, about 46 blood urea, and a creatinin of about 1.5. I presume that in spite of our efforts, there is some impairment of the kidney excretory function.

DR. EDWARD A. SCHUMANN, PHILADELPHIA, PA.—In these cases where a transplantation of the ureter seems to offer the only hope of success, I have been considering the propriety of a preliminary low colostomy, thereafter attempting to reduce the bacterial flora of the intestine by germicides and subsequently performing the ureteral transplantation. Closure of the colostomy or its retention as an open channel would naturally be decided upon by the condition of the patient or with regard to evidences of ascending infection. I would like to ask Dr. Peterson and the other gentlemen who have had experience with this operation whether they deem this a proper procedure or not?

DR. FRANKLIN H. MARTIN, CHICAGO, ILLINOIS.—The simplicity of technic in the operation is the secret of success. Dr. Charles Mayo took up this work after he had learned the technic of removing ureteral stones and has had probably the largest number of cases. He found that the less he did after incising the ureter and removing the stone, the more likely the ureters were to heal. When he began implanting the ureters into the rectum he discovered that the greatest success resulted from fewer stitches and a minimum of manipulation.

The method that proved most successful in my work was the placing in the ureter of a very soft robber catheter, decidedly smaller than the ureter. This was passed down through the rectum and out of the anus so that the urine was practically controlled for the first week of the implantation, and there was opportunity for urinalysis.

DR. PETERSON (closing).—In my paper I endeavored to confine myself to principles and omitted in the reading of the paper the results in the two cases where I transplanted the ureters. In one of these the operation was performed nearly two years ago and so far as I can tell from the examination of the urine removed from the rectum by catheter, the patient is entirely free from kidney infection. The other patient was operated upon less than a year ago. I may say I have never had more grateful patients than these two. Prior to the operation their condition was pitiable. Now they are able to retain the urine and are very happy over it.

In regard to obstetric injuries, I think we all agree with Dr. King that only occasionally do we see cases where it is impossible to close the vesicovaginal fistulas by operative means. However in my particular field of work there are many such cases because other surgeons tried to close these fistulas, and when they failed they were either sent, or the patient drifted to my clinic at the University Hospital.

In my opinion the operation is not applicable to carcinoma of the uterus because the principle upon which the operation is performed is that there shall be no dilatation of the ureters. Where the broad ligaments are involved and the disease has invaded the ureters to such an extent as to indicate transplantation, they are almost invariably dilated. As I have tried to point out in my paper, kidney infection almost invariably follows the transplantation of a dilated ureter. Transplantation in cases or carcinoma of the cervix is contraindicated.

The main thing, as Dr. Martin has said, is simplicity of technic. This is why I do not agree with Dr. Mayo's suggestion that every other stitch should perforate the ureteral wall. I found long ago that the ureter should not be held in place as it perforates the intestinal wall, with a stitch that penetrates the ureteral coat. Such penetration results in edema and shutting off of the urinary stream.

In my paper I have stated at some length my reasons for changing my mind regarding the transplantation of the ureters in human beings. I still think that there will be some infection wherever the severed ureter has been transplanted into the bowel, but I believe a technic can be perfected whereby the infection is limited and the organism will probably be able to take care of the infection for many years and possibly forever. My plea is that patients with incurable vesicovaginal fistulas lead such miserable lives that they will take any fair chance to have their condition improved, and I firmly believe that this technic gives them that chance.

DR. JOHN A. MCGLINN, Philadelphia, Pa., presented a paper entitled **Cancer of the Uterus Following Interposition Operation.** (For original article see page 626.)

DISCUSSION

DR. E. H. RICHARDSON, BALTIMORE, MD.—The occurrence of carcinoma after the Watkins' interposition operation is a rare thing. I have never seen a case and in the experience of the Johns Hopkins Clinic there has been no case of malignancy following the operation. The operation was first done in the Clinic in 1906 and to about April 1, 1927, there have been 209 cases operated upon by twenty-seven different operators. The visiting staff of the hospital which means the older, more experienced men, performed 90 of these operations, while the senior residents, men of at least four years apprenticeship, performed 119. There were seven deaths in the series, all of which occurred in the earlier years. One death followed pulmonary embolus; one was from postoperative hemorrhage on the tenth day; one from pyelonephritis with complicating bronchitis; another from postoperative hemorrhage associated with acute and severe parotitis on the eighteenth day; one from pyelonephritis and peritonitis on the tenth day; one from a pyelitis and septicemia on the twenty-fourth day; and one from surgical shock, which is the only death that has occurred in the Clinic during the past ten years from this operation.

There have been four recurrences, all of these in the earlier series when the technic of the operation was not familiar to the operators and where the operations were performed by the less experienced senior resident.

There have been quite a list of complications. There have been no instances of pregnancy. So far as possible this operation is done after the childbearing period, or if used earlier the patient is permanently sterilized and the uterus curetted at the same time. There has been no instance, so far as I could gather from the records, of a later hysterectomy being required for any cause. The complications were mostly of a minor sort, except those that I stated resulted fatally, such as the retention of urine requiring catheterization in twelve cases, postoperative hemorrhage occurring in nine cases, minor separations of the perineum occurring in nine cases, a varying degree of cystitis in seven and pyelitis in five. The other complications were one case of phlebitis, one of shock, one of bronchitis, and such minor things.

DR. WILLIAM S. STONE, NEW YORK CITY.—I have never seen cancer following this operation. I would like to discuss this case for the purpose of directing attention to what is really the modern problem, especially in cancer of the uterus, namely, the importance of recognizing precancerous lesions. Presumably, this operation was done on a uterus which contained something that was ultimately going to become cancerous, and which it was impossible to recognize at the time of operation. However, in the cervix, we often see such conditions which can be cured and so prevent the development later of cancer. Early cancer of the cervix is often difficult, if not impossible, to recognize. One does not know, sometimes, where to take the biopsy specimen. However, that is no reason why we should not make every effort. I am quite sure that, in our clinics in New York, we do not see those neglected cases of lacerated and infected tissues of the cervix, which we were accustomed to see twenty-five or more years ago. Improved obstetrics is already demonstrated by their comparative infrequency at the present time. It would be interesting to know whether or not cancer of the uterus is really increasing in frequency as cancer in general is supposed to be. Personally, I believe that cancer of the uterus is relatively less frequent today, as compared with cancer of the stomach, or cancer of the breast, and that I think is a result of our improved obstetrics during the past twenty-five years.

DR. DOUGAL BISSELL, New York City.—The total number of interposition operations performed by me according to the Watkins' technic does not exceed twenty-five, yet out of this limited number two of them, subsequent to the initial operation, developed malignancy of the corpus and one proved to be malignant when the curettings removed at operation were studied.

In the first two cases, the disease did not develop until three or more years after the interposition operation; in both of these cases hysterectomy was performed and in each instance the operation was made difficult by the fact that the union between the bladder and the posterior surface of the uterus was so intimate that these organs were separated only with the greatest difficulty, in fact, the uterine wall in one of these cases was so friable that the removal of the corpus was impossible without breaking through into the uterine body, allowing the escape of its diseased contents; the ultimate history of these two cases is not known. The report on the curettings in the third case was unfortunately not received until the patient had left the hospital; she was then communicated with and advised that the uterus be removed, but she failed to return for operation.

My objections to the Watkins' interposition operation are that when it is performed in the childbearing period, it leaves a functioning organ in an abnormal position and that if pregnancy should occur, a complication then arises which endangers the life of the patient; that interposition of the corpus before or after menopause does not lessen the possibility of malignancy, that is, the cervix and corpus are just as liable to cancer when the corpus is interposed as when not interposed and that when malignancy of either portion of the uterus occurs following interposition, eradication of the disease, either by the application of radium or by surgery, is rendered more difficult.

DR. LILIAN K. P. FARRAR, New York City.—I wish to speak particularly of Dr. Watkins' name in association with the interposition operation. In Europe the discussion is whether the operation should be called Dührrsen, Wertheim, or Schauta. I was in Vienna from 1901 to 1903 and frequently heard discussions as to who had first performed the interposition operation. Dr. Watkins' name was never mentioned as associated with the operation, and today his right to priority is not recognized in Europe. Dührrsen performed the operation known as "vaginofixation," i.e., a suture is passed through the vesical peritoneum to the fundus of the uterus, and the fundus is then fastened forward below the bladder. In December, 1899, Dr. Watkins performed the interposition operation as it is done today. In January, 1900, Wertheim performed a similar operation but with this difference: the uterus was brought into the vagina and fastened there below the bladder, but the uterus was not covered with fascia or with vaginal mucosa. Some time later Schauta performed the operation with a technic similar to that of Dr. Watkins. Unfortunately Dr. Watkins did not publish his operation until September, 1900, and Wertheim did publish his operation in February, 1900, but the priority of performing the operation belongs to Dr. Watkins. As I understand that the Society has never expressed its belief in Dr. Watkins' right to priority in performing the interposition operation, I would like to ask if these statements cannot be verified, and the credit then given to Dr. Watkins in the Transactions of the American Gynecological Society.

DR. EMIL NOVAK, Baltimore, Md.—My experience with the Watkins' operation has been much more satisfactory than that of Dr. Bissell. Like most other operators, I do the complete interposition operation only in women beyond the menopause, although even then the modified procedure usually gives excellent results. In women of childbearing age, the modified operation is done. Even this, however, may occasionally give rise to complications in the event of later pregnancy, as I had occasion to observe in two cases. In one there was a miscarriage following a good deal of discomfort, while in the other a cesarean section was necessary at term.

Dr. McGlinn stressed the great rarity of cancer following the operation. As regards cervical cancer, at least, the obvious explanation for this would seem to be that in these operations we usually eradicate a good deal of precancerous pathology. Often the cervix is the seat of laceration, ectropion, and chronic endocervicitis, constituting a real cancer menace. Such a cervix should be removed as a preliminary to the Watkins' operation. I have been more and more impressed with the importance of correcting conditions of chronic cervical irritation, especially in women beyond thirty or thirty-five. After all, such measures constitute about the only form of prophylaxis against cervical cancer which we have available. Dr. Farrar called attention to this matter in a paper before this Society last year. Aside from this, the removal of the cervix, when it is at all elongated or hypertrophic, is an important contribution to the success of the operation. Unless it is removed, it pokes its way downward in the axis of the vagina, and often gives rise to almost as much annoyance as the original condition itself. One more point may be mentioned, thought it is a rather obvious one. I have seen operators do the interposition first and then proceed to the cervical amputation, which is, under these conditions, awkward and difficult. It is obviously better to do the interposition after the removal of the cervix.

DR. JOHN O. POLAK, BROOKLYN, N. Y.—In cases of birth injury near the climacteric at the Long Island College hospital we not infrequently do a high amputation of the cervix followed by vaginal fixation. After this we introduce about 50 mg. of radium into the body of the uterus. This produces atrophy of the uterus and further safeguards the woman against cancer.

DR. HARRY S. CROSSEN, ST. LOUIS, MO.—I have had no cases of cancer of the cervix following the interposition operation.

DR. McGLINN (closing).—I included in my paper a study of the various complications which occur after the interposition operation. While cancer may develop, as Dr. Novak and Dr. Polak have pointed out, if we do routinely a high amputation of the cervix as I always do, we take away the possibility of the incidence of cancer developing in the cervix, and if we do a hysterectomy instead we will eliminate the possibility of cancer developing in the body of the uterus.

As to the success of the operation, of course, we cannot use the Watkins' operation in every case, but in the properly selected cases I think it is by far the best operation.

I also claim a little priority in reference to the Mayo operation. In doing the hysterectomy according to his technic, two years prior to the Mayo operation, I pulled on the upper stitches and the bladder promptly slid over and I interposed the broad ligaments between the vagina and the uterus. I thought, however, that that was an accident and I did not publish it. I do the operation very frequently at the present time.

There are certain important points that a review of the literature brings out, particularly in reference to pregnancy.

Pregnancy is a serious complication if it develops after the operation. Three cases of pregnancy have occurred after resection of the tubes, so that interposition should be done if possible only after menopause, but if done prior to menopause the patient should be sterilized.

After reviewing the question of priority, my paper states that Dr. Pepper gives full credit to Dr. Watkins.

DR. FRED J. TAUSSIG, St. Louis, Mo., read a paper entited **The Amniotic Fluid and Its Quantitative Variability.** (For original article see page 505, September issue.)

DISCUSSION

DR. HUGO EHRENFEST, ST. LOUIS, MO.—I believe that the average large weight of the placenta in these cases is due merely to the average large weight of the babies. Since in the main the secretion of the amniotic fluid is achieved by the placental surface, it would seem more important to investigate the size rather than the weight of the placenta.

The other interesting point is the obvious fact that there must be also persistently going on an absorption of amniotic fluid, and this process surely must play a rôle in the preservation of a normal amount of fluid or in the production of hydramnios. In his paper Dr. Taussig lays great stress on the swallowing of the fluid by the fetus. This explanation does not particularly appeal to me. What becomes of the amniotic fluid that the fetus swallows? We know that free urinary secretion occurs late in pregnancy. Certain clinical experiences prove that there must be some fetal kidney function earlier as well. I cannot conceive of the idea that the amniotic fluid swallowed by the fetus would be absorbed into the maternal circulation and not be secreted through the kidney back into the amniotic sac in the usual way. I therefore doubt the importance of lack of swallowing, proved in some isolated cases, as a significant etiologic factor in the production of polyhydramnios. I think the outstanding fact in connection with such instances of obstructed esophagus is the admitted frequency with which hydramnios is encountered in various types of fetal malformation. In the cases quoted by Dr. Taussig we recognize this prevalence of malformations in relation to polyhydramnios and I do not think that any of the various explanations of its origin so far advanced is really acceptable.

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MD.—Dr. Taussig did not tell us the cause of hydramnios, as I was hoping he would. In general, it may be said that we know almost as little about its cause as did our grandfathers. There are, however, one or two negative phases of the question. First of all, I do not think that hydramnios is due to syphilis, because in my experience, it occurs no more frequently in syphilitic than in non-syphilitic women, and particularly because it occurs in many women who are known not to have syphilis. In the second place, I do not think that any connection can be demonstrated with chorioangioma, and I base my conclusion upon the fact that hydramnios was absent in the cases in my service in which the placenta contained tumors of that type.

For years I have believed that in the great majority of cases the fetus itself has little to do with the production of hydramnios. This is clearly demonstrable in the so-called "dropsical ova," in which the amniotic cavity is distended by relatively large amounts of fluid, while the embryo is either very rudimentary or entirely absent. On the other hand, the evidence is very strong in hydramnios associated with single ovum twins that the excessive amount of fluid is due to renal activity on the part of the larger twin. In such cases, it is usually possible to demonstrate that the latter takes over an increasingly larger part of the intercommunicating placental circulation, with consequent hypertrophy and activity of its heart, liver, and kidneys, and that those organs are frequently several times heavier in the larger than in the smaller twin.

I think it fair to state that in most cases of ordinary hydramnios, the underlying cause lies in some derangement of the secretory activity of the amniotic epithelium, but at present no evidence is available as to how it is brought about.

DR. JOSEPH B. DELEE, CHICAGO, ILL.—Some years ago I gave to eight or ten women in labor methylene blue by mouth; then we watched the babies during birth and the diaper for three days after birth. The babies passed blue urine, the mothers did also, and the babies continued to pass blue urine for two or three days after delivery. That made me believe that the baby does not urinate into the amniotic sac.

I have been using magnesium sulphate in the treatment of eclampsia, and it has seemed to me that those women have less liquor amnii. We have only begun the treatment of these cases recently and I offer this suggestion for what it may be worth.

DR. GEORGE W. KOSMAK, NEW YORK CITY.—There is one point in the pathology of the amniotic membranes that I had hoped Dr. Taussig would bring out; namely, the disputed question as to whether this membrane is permeable by bacterial organisms. We get undoubted infections of the fetal skin resembling the small impetigo blebs that sometimes occur after birth, from which can be secured pure cultures of staphylococci. It is usually assumed that the contents of the amniotic sac are sterile and that they do not become infected until after rupture of the membranes. But how can we account for these cases of what seemed to be undoubted infections of the fetus where the rupture of the membranes has not occurred?

Another point that we should take up in this connection is pulmonary infection of the fetus. In autopsy studies of fetuses made at the Sloane Hospital some years ago, pulmonary involvement to the degree of an actual pneumonia was found and in those cases infections of the lungs undoubtedly occurred before the babies were born.

DR. JOSEPH L. BAER, CHICAGO, ILL.—I would like to refer to a case of an unusually rapid reformation of the lost liquor amnii. This patient had been married five years before becoming pregnant. After sixteen to eighteen weeks of pregnancy, about when she was expected to feel life, she suddenly flooded the bed. The uterus shrunk from the size of an eighteen weeks' pregnancy to a small hard mass, the size of a scant twelve weeks' pregnancy. I revisited her in two days and the uterus had entirely regained its original size; the quantity of fluid was apparently completely restored; within two weeks thereafter the patient felt life and the pregnancy continued uneventfully.

DR. TAUSSIG (closing).—Regarding Dr. Ehrenfest's criticism of the evidence of the swallowing of fluid by the fetus, I think the evidence is very strong that this plays an important rôle. Experimentally we know that if lycopodium powder is injected into the amniotic cavity it will be swallowed by the fetus as early as the middle of pregnancy, and that this occurs regularly in the last half of pregnancy there can be no doubt.

Furthermore, the blood supply of the fetal kidney is relatively slight compared with that of the intestines and I feel that fluid can pass much more rapidly through these intestinal vessels out via the cord than it can possibly pass the secretorial function of the kidney. In those cases of obstruction of the urinary tract that Dr. Ehrenfest refers to, examination of the fluid shows that it corresponds rather to the fluids found in edema and that this fluid is very frequently only a portion of a general anasarca.

Dr. DeLee's experiments are very interesting. The work that has been carried on along that line shows that the methylene blue does pass into the amniotic cavity, but it passes as a colorless chemical and so gives definite evidence of the metabolic function of the amniotic epithelium.

My report is rather in the nature of a preliminary communication which I hope to amplify in the future by more extensive biochemical study of the amniotic fluid and of the amnion.

DR. ARTHUR H. BILL, Cleveland, Ohio, by invitation, read a paper on **The Treatment of Placenta Previa.** (For original article see page 523, September issue.)

DISCUSSION

DR. EDMUND B. PIPER, PHILADELPHIA, PA.—Dr. Bill should have differentiated between the ward cases and his own cases, watched from the beginning of their pregnancies and in labor. It has been my experience that the maternal mortalities are largely among ward cases where there is no record of the blood lost. I recall a case similar to the one he spoke of which emphasizes a point. The patient was easily delivered by version, with a partial placenta previa and a wide open cervix. Cesarean section was unnecessary in that case. Shortly after operation the patient was dead. She had not had a postpartum hemorrhage that would disturb the pulse of an ordinary individual. Dr. Bill stated, I think, that the cause of death in every case of placenta previa is postpartum hemorrhage. He spoke of bags as a conservative treatment. If one uses bags in central placenta previa; or the old method of pulling down one leg and using that as a tampon, it seems to me that the fetal mortality will be at least greatly increased; whether you will get better maternal results I do not know.

Another point I gathered was that there is rarely postpartum hemorrhage following cesarean section. I think the indication for cesarean section in placenta previa depends not upon whether the patient is a multipara, but upon the condition of the cervix. If there is a dilated cervix you may succeed with a vaginal delivery, but I think true conservation is where there is no progress in labor and where cesarean section is electively done.

One thing Dr. Bill did not mention and I may be entirely wrong about it, but following the case I spoke of, I have made it a routine practice, just as in the vaginal delivery of a premature separation, to pack every case of placenta previa that is delivered through the vagina. Hemorrhage usually comes from the lower uterine segment.

DR. BENJAMIN P. WATSON, NEW YORK CITY.—The great difficulty in discussing the treatment of placenta previa and especially in attempting to lay down a definite routine is that cases differ so much in severity, and so much depends upon the time at which the case is seen and upon the way in which it may have been handled previously. There is not and never can be one standard form of treatment for all cases. One would like to know in any series of cases how many had been seen at first hand by the man who ultimately treated the case and how many had been handled in the hospital.

That discussion of alternative treatments is necessary is shown by the high maternal and fetal mortality obtaining in our obstetric hospitals. Along with Dr. Douglas Miller I made an analysis of the 279 cases in the Edinburgh Royal Maternity Hospital between the years 1914 and 1924. The maternal mortality was 8.9 per cent and the fetal 64 per cent. Munro-Kerr reported a series of 476 cases in the Glasgow Maternity Hospital with a maternal mortality of 11.5 per cent and a fetal mortality of 71.84 per cent. Miller, of New Orleans, in 40 cases reports maternal mortality 20 per cent, fetal 54 per cent. In the Boston Lying-in Hospital in a series of 151 cases occurring between 1915 and 1925 Kellogg found a maternal mortality of 8.25 per cent. In the five years from 1921 to 1926, 57 cases treated in the Sloane Hospital, New York, gave a maternal mortality of 7 per cent and a fetal mortality of 47.4 per cent. The best results I have seen are those of Essen-Moller who, in 132 cases, had a maternal mortality of 3.7 per cent and a fetal mortality of 45.6 per cent. No surgeon is satisfied with such results and consequently there is a growing tendency to discard the older methods of treatment and resort more and more to cesarean section. With this tendency I am in agreement provided it be recognized that cesarean section is not to be regarded as a routine treatment for all cases but that it be performed only on certain definite indications. What these indications are cannot be laid down arbitrarily. They can only be determined in the individual case by one who is a trained obstetrician with experience in all the other methods of treatment available.

If the child were the only consideration there could be no doubt that cesarean section would be the best form of treatment in practically every case. Even when the child is premature cesarean section offers a better chance of life than any other form of delivery, so that if pregnancy has advanced beyond the thirty-fourth week it must be considered from this point of view. We do cesarean section in minor degrees of contracted pelves rather than risk the life of the child by a version or high forceps operation. We look upon destructive operations on the living child in order to effect delivery as only justified in rare and exceptional cases. Yet when we use a bag in a case of central placenta previa, and especially when we do an early version and bring down a leg, using the child as a plug, we are sacrificing it almost as deliberately as when we do a craniotomy. My Edinburgh figures show a fetal mortality of over 90 per cent in central placenta previa treated in this way, and of 75 per cent in cases other than central. From the point of view of the child the argument for cesarean section is unanswerable if the child has reached a viable age.

Again quoting the Edinburgh figures the maternal mortality in cases of central placenta previa was 23.5 per cent and in cases of partial placenta previa just over 4 per cent. In the Sloane Hospital the corresponding figures in a much smaller number of cases are 13 per cent and 5 per cent. This is a strong argument for cesarean section in cases of central placenta previa, for the recorded statistics, when cesarean section has been done in such cases, show a maternal mortality of from 5 to 7 per cent.

Essen-Moller (*Acta Gynecologica Scandinavia*, 1921, Vol. i) advocates vaginal cesarean section, having thus treated twelve patients without maternal or fetal death. I think the concensus of opinion in this country is against such a procedure. I certainly should not like to undertake it in the type of case where one thought that something more radical than a bag or version was required.

It cannot be too strongly emphasized to the profession that success in dealing with a case of placenta previa depends upon:

1. The immediate hospitalization of the patient on the first hemorrhage;
2. The examination of the patient only after the most careful preparation and when everything that may be necessary in the treatment of the case is ready to hand; and
3. Transfusion of cases where there has been severe loss of blood.

If we saw all patients under such circumstances, before any treatment, such as packing or bagging, had been already done, a larger number would be found in the cesarean section class, and as a result, there would be an improvement of both maternal and fetal mortality figures. A very large number of cases would require no treatment at all other than perhaps rupture of the membranes. In my Edinburgh series there were 29 such cases with no maternal deaths and a 31 per cent fetal mortality. When a vaginal pack alone was used in 20 cases there were again no maternal deaths and a 50 per cent fetal mortality. When version was necessary, after packing, the maternal mortality was 18 per cent. In many of these cases the packing had been done outside the hospital. There can be no doubt that this combination is a very dangerous one and for that reason the vaginal tampon ought to be very seldom used. If the patient cannot be hospitalized and adequate assistance secured, the safest procedure in the hands of the ordinary practitioner in domestic practice is version and the bringing down of the leg. The fetal mortality will be high, but the maternal will be less.

I have been very much impressed with the fact that preliminary transfusion is a most important thing in the treatment of those cases. We have had comparatively little experience with it, for transfusion had not reached the stage with us in Edinburgh that it has reached here. I am very much impressed with the results shown and think we owe a debt of gratitude to Dr. Bill for bringing this subject to us in such convincing form.

DR. M. PIERCE RUCKER, RICHMOND, VA.—I have had no set program for the treatment of placenta previa. At first the mild cases were allowed to take care of themselves; the more severe ones were treated by Marmaduke Wright's version, and the most severe cases by cesarean section, but as I became more accustomed to Potter's version I have relied more and more on this operation and upon the Voorhees' bag to control the hemorrhage. If the bag be used it should be a large one, preferably a number five.

In my eighty cases there was one maternal death, a case that illustrates well Dr. Bill's plea for a preliminary blood transfusion. This patient was brought forty miles to the hospital after her third severe hemorrhage in as many weeks. Like Dr. Bill's case, her husband was not enthusiastic about blood transfusion. While we were hunting around for a suitable donor, I introduced a No. 5 Voorhees' bag extraovularly. The cervix dilated with unexpected rapidity and I was forced to operate without the patient's being fortified by the transfusion. I did a version under ether anesthesia with practically no loss of blood. The patient died one and a half hours later of dilation of the heart.

My maternal results so far as febrile puerperiums are concerned are shown in Table I. Table II shows the fetal deaths in the whole series and also in those cases that had reached near term.

TABLE I. SHOWING MATERNAL RESULTS IN TREATING EIGHTY CASES OF PLACENTA PREVIA

MODE OF DELIVERY	NO. OF CASES	INFECTIONS	
		NO.	PER CENT
Spontaneous delivery	15	2	13
Bag	5	0	
Pituitrin	1	0	
	21		10
Breech extraction	3	1	33
Bag	5	1	20
	8		25
Low forceps	1	0	
Craniotomy	1	1	100
Cesarean section	5	0	
Braxton Hicks' version	6	0	
Bag	3	0	
	9		
Potter's version	6	2	33
Accouchement forcé	3	0	
Bag	25	0	
Pituitrin and bag	1	0	
	35		6
Total	80	7	8.75
Total number of bag cases	41	1	2.44
Accouchement forcé	3	0	

TABLE II. SHOWING FETAL DEATHS IN TREATING EIGHTY CASES OF PLACENTA PREVIA

MODE OF DELIVERY	TOTAL FETAL DEATHS		DEATHS OF FETUSES ABOVE 45 CM. LENGTH	
Spontaneous delivery	4 (27%)		1 (8%)	
Bag	5 (100%)		2 (100%)	
		9 (43%)		3 (21%)
Breech extraction	3 (100%)		0	
Bag	4 (80%)		2 (66%)	
		7 (88%)		2 (66%)
	0			
Craniotomy	1 (100%)		0	
Cesarean section	2 (40%)		0	
Braxton Hick's version	1 (17%)		0	
Bag	3 (100%)		0	
		4 (33%)		
Potter's version	1 (17%)		0	
Accouchement forcé	1 (33%)		0	
Bag	9 (36%)		4 (20%)	
Pituitrin and bag	1 (100%)		0	
		12 (34%)		4 (14%)
Total	35 (44%)		9 (17%)	
Total bag cases	22 (54%)		8 (29%)	

DR. RUDOLPH W. HOLMES, *Chicago, Ill.*—Read and Mueller, many years ago, compiled an exceptionally large number of cases of placenta previa: the causes of death from both statistical studies were essentially the same: one-quarter died from antepartum hemorrhage, about one-half from postpartum hemorrhage, and a quarter from sepsis. These cases were accumulated early in the antiseptic days, therefore, sepsis was prevalent: in these later days the mortality rate, from better asepsis, and technic of delivery, has fallen enormously, yet the relative incidence from septic deaths has not varied from those early statistical studies.

In 1905 I collected all the available cases of cesarean section for placenta previa. The mortality was so high that I stated in my paper that cesarean section killed a woman in order that a baby might be saved: this statement was substantiated by a comparison of mortalities in women treated obstetrically. Of course this statement is no longer true: but at the time of writing that paper I was convinced that cesarean section was a mistake when applied to the placenta previa case. Today, I believe cesarean section is the only approved method of delivery under certain conditions obtaining in placenta previa. I still believe the old obstetric aphorism that we must consider the mother and largely disregard the welfare of the baby in placenta previa is as true now as when first stated: the hemorrhage from placenta previa is rarely evidenced at term, its usual appearance is from the sixth to eighth month, therefore, the premature babies are compromised before delivery takes place. Kuehn found that of some twenty-five babies born alive from placenta previa mothers only one was alive at the end of two years.

After all is said and done the incidence of placenta previa is very low: I have had only two cases in all my personal private practice. As we find them, placenta previas reach us through the clinic and consultation—as a result the women come to use untreated, mistreated, in exsanguination. The untreated patients are more amenable to our care than the mistreated ones, for they have not been contaminated by unclean hands.

Cesarean section has its definitely clear field: first, in all women who not only have the previa but have a contracted pelvis; secondly, in a complete previa in a primipara or multipara. A primipara with placenta previa even of a partial degree, is more wisely delivered from above; in a lateral previa I would hold that pure obstetric procedures are more appropriate. That obstetric procedures have their due place in previa is evidenced by the fact that Stratz had 167 cases with one death, his fifty-fifth case.

The personal equation must always be one of the essential factors in determining whether this or that procedure shall be employed in a given case, and this is nowhere more important than in the treatment of placenta previa. Many consider the tampon as an obsolete procedure, but I am firmly convinced that it has its place, as a prophylactic measure when the woman must be transported a long distance over bad roads to the hospital, or in an hospital when an alarming hemorrhage occurs and one must wait until the operating room is "set up"; when blood transfusion is imperatively necessary, the tampon will give time for the woman to react.

DR. JOSEPH B. DE LEE, Chicago, Ill.—I would like to call attention to the fact that the loss of blood may not always be determined by the pulse rate, by blood pressure readings, or by the blood count. For temporary periods nature has a means of keeping these physical conditions at a stage that impresses one as being normal or near normal when, as a matter of fact, there is depletion which will show up after delivery.

My treatment of placenta previa is now reversed. It used to be unusual to do cesarean section in placenta previa; now it is exceedingly unusual not to do it. When a patient enters the hospital with a suspected placenta previa, if not at term, she is put to bed to rest, and morphine is given to stop the pains. If there is sufficient hemorrhage to justify interference the patient is prepared for every possible method of treatment, and we decide what method we shall use after the first examination. If her condition is not too bad she is sent to the x-ray room and a picture taken to see if there is monster. Dr. Greenhill has collected from the literature 46 cases of monstrosities in placenta previa. Of 16 monsters that we have had in the Chicago Lying-in Hospital, eight were associated with placenta previa.

Primipara whether they are young or old are always delivered by cesarean section. A central placenta previa always has cesarean section done. If the patient is a multipara and has many living children we may do a Porro operation. The most important decision, however, is not whether she is to have an abdominal delivery, but what form of abdominal delivery? The low cervical cesarean is so much safer than the classical cesarean that the indication for the operation is doubly strong when one is capable of doing it. In the classical operation the placenta has to be cut through in one-half of the cases and there is more or less severe hemorrhage until we get the baby out; with the low cervical, the placenta is normally above and we do not have to fear hemorrhage. However, in doing the low operation for placenta previa one has to go through the placenta if it is on the anterior wall. If it is on the posterior wall this is not necessary. The risks of hemorrhage are about the same for both methods. If the placenta is on the anterior wall the patient should be fortified with a transfusion, or salt solution, because sometimes the amount of hemorrhage is as great as in the classical cesarean and might be very dangerous.

Referring to Dr. Bill's patient who died, I think there are possibly two explanations: First, that the woman may have had a bleeding from a torn vessel in the placental site. Sometimes these can be sewed up with the low operation, but not in the classical. Secondly, the sutured uterus may have ruptured during an afterpain because no matter how well the uterus is sutured, it may burst in the classical cesarean section. There are 14 cases on record.

DR. ALFRED C. BECK, Brooklyn, N. Y.—Cases of placenta previa usually are potentially infected when they enter the hospital and for that reason cesarean section, in our opinion, is contraindicated. In the few instances, however, where we have done cesarean section the results have been very good. Most of our patients have been treated by the older methods, and our results have been much better than those reported this afternoon. We believe this is due to what Dr. Holmes has already stressed, namely, disregard of the child when once the decision is made to handle the case from below.

When a version is done we let the woman deliver the child. When the bag is inserted, if the head follows the bag we wait for spontaneous delivery. In that way we avoid trauma to the cervix and placental site. Likewise we avoid the need for anesthesia, and by eliminating these two factors we probably avoid many cases of postpartum hemorrhage.

DR. BILL (closing).—The fetal mortality mentioned in my paper was given merely for the sake of statistics and not as a reason for performing cesarean section, because we all know that cesarean section gives the lowest fetal mortality. The argument in favor of cesarean section was that it gave the best results for the mother. The fetal mortality of 35 per cent is probably as low as one could expect. That included all the premature babies and stillbirths.

We do not pack the uterus after cesarean section for placenta previa and ordinarily do not encounter postpartum hemorrhage. The uterus was not packed in any of the cesarean operations reported.

Dr. DeLee questioned whether the one death could have been due to bleeding from the placental site. I do not believe so because after delivery, when the uterus contracted and remained firm, there was no bleeding.

I do not believe the patient's condition can always be estimated by the pulse rate. The pulse is sometimes not rapid even though the patient is pretty well exsanguinated. While the blood pressure may not indicate exactly the loss of blood it does indicate the degree of shock resulting from the hemorrhage and I believe it is probably the most dependable test we have for estimating the condition of the patient.

In choosing cesarean section for placenta previa we do not consider the age of the patient, nor the parity, nor do we consider very much the grade of placenta previa present and do not make any special effort to determine that by examination. If the patient has a complete previa she will bleed before there is dilatation. If there is no bleeding until there is considerable dilatation and this is controlled by the head, there is naturally a placenta previa of lower grade and those are the cases which do not require a cesarean section. Therefore, I believe that the cervix is the determining factor in deciding whether or not to do a cesarean section.

I agree with the statement that our more serious cases are among the ward cases. A private patient who has an antepartum hemorrhage usually reports it at once whereas sometimes the ward cases are neglected and sent to the hospital as emergency cases after having bled for some time. I believe that the length of time over which bleeding has taken place is a very important factor. I spoke of two cases. One seemed about as serious as the other, but one lived and the other died. These cases illustrate the fact that the patient who has a severe hemorrhage and is treated immediately will probably recover because she is not in the same condition of shock as the patient who is allowed to bleed over a considerable interval of time and who has reached a condition of shock from which she may not recover.

Regardless of the choice of method for delivery in cases of placenta previa, prophylactic blood transfusion is a most essential part of the treatment.

(To be continued in December issue.)

NEW YORK OBSTETRICAL SOCIETY

MEETING OF FEBRUARY 8, 1927

DR. CHARLES A. GORDON read a paper entitled **Respiratory Emphysema in Labor.** (For original article see page 633.)

DISCUSSION

DR. GEO. W. KOSMAK, after referring to his own case reported some years ago, agreed that this constitutes one of the more unusual complications of pregnancy and believed the most likely explanation is that the trachea or some of the larger bronchi rupture through the voluntary expulsive efforts made by the patient. Usually these women are directed to take a long breath and hold it, which fills the respiratory passages with the maximum amount of air, and they are then urged to bear down. Just why these respiratory passages rupture in one woman and not in another is pretty hard to explain. Dr. Kosmak felt that the lesson to be learned from this presentation is that we had better desist in instructing our patients to hold their breath when bearing down. In the cases reported only two deaths occurred. The others got well. At the same time, it is a rather disagreeable experience. It frightens the patient a great deal and likewise worries the attendant.

DR. HERMANN GRAD said that he had seen one case of emphysema following labor. The patient was a primipara and while he was doing a low forceps operation the house surgeon, who was giving the chloroform, remarked that there was something very peculiar on the left side of the patient's neck. After delivery palpation gave the characteristic crackling sensation but nothing abnormal was found in the chest. The next day the patient complained of some difficulty in swallowing, and examination of the buccal cavity showed an area of trauma, the mucous membrane was bluish on the left side. The emphysema did not spread after labor and disappeared in about ten days.

DR. GORDON (closing) said that Dr. Kosmak's theory that it is due to a wound of the trachea, is also held by many others, and yet it is one which is difficult to prove on account of the cartilaginous strength of the rings of the trachea. He found three or four cases reported under the head of hernia bronchialis. Three were cases in which the woman following labor had not recovered, but showed a large tumor in the neck, which looked like an enlarged thyroid, and the condition was then referred to as "aerogeneous goiter." That was in 1853. In the subsequent labors the swelling of the neck got larger and larger. During inspiration if the patient took a long breath, the air would disappear from the tumor of the neck, and when she expired it would fill again. Hernia bronchialis then was thought to be caused by a rupture of the cricothyroid membrane, a little tear which allowed the mucosa of the trachea to come through the wound. Others held that the wound in tho trachea was caused by violently throwing the neck back. That also cannot be substantiated, and in all this work no pathologic evidence of any kind has been brought forward.

DR. F. C. FREED (by invitation) presented a paper entitled **Clinical Signs of Fetal Distress During Labor.** (For original article see page 659.)

DISCUSSION

DR. ASA B. DAVIS felt that the paper did not stress sufficiently the irregularity of the fetal heart. The slowing of the fetal heart is, of course, a danger signal, but occasionally it slows and then becomes very rapid, as in one case, a primipara in the first stage of labor. Her first stage was slow and went on for twelve hours. Then the fetal heart after coming down to about 100, went up to 180 and 190, and between the pains it would assume the normal rate, and then stop. Dr. Davis did a manual dilatation and brought the cervix down, slit it on both sides and did a version. The hand in the uterus failed to detect any pulsations of the cord, and the child was going through paroxysms as though it were about to die. There was a true knot in the cord that had been drawn absolutely tight, so that the circulation had been cut off intermittently.

DR. PAUL T. HARPER asked about the comparative value of ether as contrasted with chloroform for the relief of persistent uterine tonicity in an attempt to conserve the fetal heart, and as to the frequency with which Dr. Freed noted an acceleration of the fetal heart before a drop.

DR. WILLIAM PFEIFFER said that in making a study of some cases of true cord knots no change in the heart and no sign of asphyxia of the baby could be noted. Not only is the rate of the baby's heart after the contraction has passed off, important, but also how quickly it returns to normal. Polak pointed out some time ago, during the furor of "Twilight Sleep," that a heart that might be slowed down would return quickly to the normal; hence the child would not be in danger. If the heart came back slowly and haltingly to the normal rate, there was danger. Dr. Pfeiffer did not agree that the meconium can be disregarded in head-first cases, but always felt that the child was at least partially asphyxiated. If we recall the mechanism by which the meconium is found in amniotic fluid, it is in itself an evidence of asphyxia, otherwise the anus would not relax.

DR. GEO. W. KOSMAK said it seems rather strange that during the comparatively long period in which the fetal heart rate has been observed, we still rely on the ordinary stethoscope. The physicists have succeeded in developing instruments that demonstrate the fetal heart sounds much more satisfactorily than we are able to get them with the stethoscope, and yet few of the obstetricians have ever favored this method. Peterson, of Ann Arbor, made use of an apparatus of this kind whereby the fetal heart could be recognized by the attending physician through the telephone while reposing calmly in his bed at home. None of the maternity hospitals have taken up this question and attempted to use an apparatus of this character, although the physicists are evidently aware of its importance.

DR. HERBERT THOMS made a plea for direct auscultation in those cases where the fetal heart is not readily heard with the stethoscope. By placing a towel over the patient's bare abdomen and by listening with the ear firmly placed on this covering, the fetal heart may be heard with surprising clearness, especially in certain cases that are difficult to elicit with the stethoscope.

DR. FREED (closing) recalled that Dr. Falls and Dr. Rockwood, of the University of Iowa, described a microphonic stethoscope devised to magnify the heart tones so that they could be heard throughout the room. G. Schwartz, of Königsberg, devised an apparatus similar to the electric cardiographic machine that would give a graphic representation of the fetal heart sounds. Nauche, many years ago, invented the metroscope, a curved instrument that could be introduced into the vagina. It was fashioned after the stethoscope, and with it he claimed to have heard the fetal heart sounds earlier in pregnancy than they could be heard by other means. For many of his observations Dr. Freed used a Falls' modification of the DeLee stethoscope with a watch and mirror attachment, but such a stethoscope is cumbersome, fragile and expensive, and cannot be recommended for general use. In none of Dr. Freed's cases was pituitary extract used. Pituitary extract should be used only in minimum doses if the welfare of the baby is to be guarded.

Dr. Freed used only chloroform in the cases mentioned, as it does not irritate or excite the patient, and its effect is almost instantaneous, giving immediate relaxation of the uterus, thereby relieving undue pressure on the placenta and fetus. Rarely did he observe a primary acceleration of the fetal heartbeat before the fetal heart slowed down. When a slowing occurred, in the majority of cases, it was sudden and without such a warning.

Meconium, in vertex presentations, appeared so frequently without changes in the fetal heart rate that he did not regard this of serious importance. It has been noticed especially frequently since using the morphine and magnesium sulphate and rectal ether-quinine instillations for analgesia. However, we have no proof that the drugs have been responsible for it. Excessive pressure of the uterus on a large baby may cause it by actually forcing meconium through the sphincter ani. Only when the appearance of meconium was noted with an accompanying slow fetal heart rate was its presence considered significant.

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, JANUARY 21, 1927

DR. CAREY CULBERTSON presented two specimens from cases of **Excessive Bleeding from the Uterus.**

The first patient, Mrs. L. E., forty-three years of age, had been bleeding for the past four or five months and at the same time she had a swelling in the lower abdomen. This swelling was perfectly symmetric, round, rather firm, and about the size of a five months' pregnancy. The cervix was soft and patulous. Menstruation was normal.

The last periods occurred on November 4 and December 2. She had two children living and well. She was under observation in the Cook County Hospital for twenty-eight days before operation. The possibility of pregnancy, hydatid mole, adenomyoma, cystic fibroid were all considered.

At operation a cyst of the anterior uterine wall was found. The uterine cavity was four and one-half inches deep, the mucosa was normal, and the cavity empty. The cystic swelling contained about sixteen ounces of clear serous-like fluid which coagulated upon exposure to the air. The cavity was lined by a thick yellow membrane with a shiny surface, probably representing a fatty degeneration of the capsule, with a complete cystic change of a fibroid.

The second specimen also represents excessive bleeding in a patient, forty-two years of age, who had never been pregnant. This patient had never had regular periods; sometimes they occurred every three weeks and again every two weeks, with never more than four weeks between them. If excited, worried, or annoyed she would menstruate at once. The duration of the period was usually seven days; very profuse, with clots. There were cramps at times on the first day. Her last period was January 2. On examination the vagina was nulliparous, the cervix was closed and free, the corpus upright and free but enlarged and slightly asymmetric, giving the gross appearance of containing a small fibroid. The appendages were free and not involved.

She was operated upon on January 17. The uterine wall was twice the normal thickness and fibrous, the cavity two and one-half inches deep, the mucosa markedly hyperplastic and polypoid. The cervix was elongated. One pea-sized submucous fibroid growth was in the anterior wall. A vaginal hysterectomy was performed.

Here we have an unusual case of fibrosis uteri in a nullipara. The condition is rare but has been described by Fletcher Shaw, who thinks this increase *in the* size of the uterus is a work hypertrophy and is always associated with hyperplasia of the endometrium.

DR. SIDNEY SCHOCHET reported two cases of so-called **Primary Adenocarcinoma of the Appendix.**

These cases are very often overlooked and not diagnosed until the appendix is microscopically examined, *and have been erroneously termed primary adenocarcinoma.* They belong to a group of tumors which are really endocrine and arise from glands in the appendix, take on a peculiar silver nitrate stain, and are better classified as argentine tumors. They are small, malignant, and have a tendency to metastasize. The cells are small with clear vesicular nuclei well defined and are diagnosed from the silver stain. The cells have no connective-tissue stroma.

In the first case the tumor was diagnosed only on microscopic examination of the appendix.

The second patient was a woman, thirty years of age, who came in with a dull aching pain in the region of the right quadrant, with symptoms of chronic appendicitis. The appendix was removed. Microscopic section demonstrated definite endometrial tissue; in other words, an adenomyoma of the appendix.

The third case was an adenoma of the umbilicus. There was no history of a previous operation or a transplantation from the endometrium.

DR. GILBERT FITZ-PATRICK, by invitation, presented a paper entitled, **How Shall We Deal with the Cancer Menace?** (*See page 616.*)

DISCUSSION

DR. C. S. BACON wondered how much danger there is in cancerphobia, from such meetings, in women who have wrought themselves up to a state of nervous excitement which has a bad effect on their physical being and has led to a great deal of unhappiness.

DR. HENRY SCHMITZ said that if we could demonstrate to the physicians carcinomatous uteri in various stages we then could point out the early and hence operable cases. This would help in two ways: In the first place to bring the patients earlier for diagnosis, and secondly, to exclude from unnecessary operation many of these patients. The suggestion of the American Society for the Control of Cancer that in every medical school there should be arranged a yearly cancer day for senior and junior students in which the various specialists would discuss the clinical and diagnostic aspects of carcinomas in various regions of the body, would induce the student to give cancer disease the attention that it deserves. Dr. Schmitz did not believe that by instruction of the laity carcinomaphobia would be caused. If a person could be made to worry over the ulcer, the sore, or the hemorrhage that might be cancer, we would then have attained the purpose for which the work was undertaken, namely, to have the chronic sore and the chronic lesion examined by competent men to exclude carcinoma. This certainly would induce many patients to have such lesions looked after immediately instead of waiting until they begin to grow and cause harm.

Concerning the second question, of cancer control: It seemed to him that cancer hospitals and cancer clinics would serve their purpose. The medical practitioner and student may go to these institutions and be instructed in the clinical aspects of cancer diseases. Such enlightenment would certainly tend to send patients to the hospitals earlier for treatment. Surgery and radiation therapy have reached such a stage of perfection that we cannot blame the bad statistics of cancer on the treatment. If cancer cases would come to the specialist when the disease is still in the localized stage, then operation would certainly cure 75 per cent of the cases. By "cure" is meant that the patient five years after treatment is free from any palpatory and visible evidence of the disease.

DR. FITZ-PATRICK (closing) said in reference to cancerphobia that a large number of diseases have a psychosis entity. In cancer it is "fear"; as a rule this will lead the subject to seek advice. A consultation is undertaken by a patient as a serious piece of business. The physician should so consider the interview, and after a painstaking examination, advise the patient, or refer him for an adequate opinion.

It was his observation in this respect that some members of the profession are very derelict; patients are sent away after a casual or no examination at all, advised to await developments. They are dissatisfied, the spell of "fear" has not been dispelled, they seek other advice, read questionable literature, and may fall into the hands of charlatans. For these and other reasons, known facts in the advancement of medicine must be made available to all the profession and for the special benefit of mankind.

If the members of the medical profession do not respect this dictum and assume their responsibility in the dissemination of knowledge and through adequate advice founded upon a complete and satisfactory examination, they must expect the quack, the faker, and charlatan to flourish, because this is an inquiring age, and the people are seeking knowledge and service. They have assumed their financial responsibility through buying stamps for the control of tuberculosis and the incidence has been cut in two. They are ready likewise to meet the cancer problem, and it is the duty of the medical profession as a whole to prepare themselves for the task.

As to a Cancer Research Hospital maintained by the state, although the statutes provide for the care of the destitute in each county, a special hospital manned by an able staff of experts, assisted by a corps of earnest workers is highly desirable. A large number of patients could be studied, careful tabulations recorded, new treatment employed. For until the problem of cancer is solved it is the people's business to assist and provide a place wherein special research can be conducted to the end that it is their welfare that confronts the state.

DR. HENRY SCHMITZ read a paper on **Carcinoma of the Uterine Cervix.** (For original article see page 580.)

DISCUSSION

DR. SIDNEY SCHOCHET said it was difficult to discuss any subject of which we do not know the etiology or what led to the conclusion. In this paper one conclusion would be that function is a great factor and a second conclusion would be that inflammatory conditions were an etiologic factor.

Dr. Schochet claimed that Dr. Schmitz is deserving of special credit for giving to the medical profession a clinical classification as to the extent of malignancy. That classification is being used extensively, especially by Ward, because it does give us some common ground as to what we mean by the extent of malignancy, and has brought us a great step forward in concluding what particular methods of treatment should be used.

His point as to the degree of malignancy and as to the type of cells, is entirely new, and yet judging from the remarks that have been made Dr. Schochet would question very seriously whether one could state the extent of growth by the type of mitosis, because we know all tissues have a periodic wave of growth. If you should happen to catch the normal tissue at a certain level the number of mitotic figures will be less than in the actively growing normal tissue.

DR. N. S. HEANEY said that Dr. Schmitz mentioned infection and irritation as etiologic factors in the causation of cancer of the cervix. At the last meeting of the American Gynecological Society, a paper was presented advocating the repair of all torn or diseased cervices in order to prevent subsequent carcinoma of the cervix. Cancer in other parts of the body may be produced by irritation and infection. By analogy it might be argued that they may also produce cancer of the cervix. Who, however, knows of a single authentic case? Has anyone here seen a patient who has had a carcinoma of the cervix develop during the time that she was under observation for an infection of the cervix or for any other pelvic disease? Dr. Heaney saw one case where a carcinoma of the vault of the vagina developed around the posterior bar of a pessary which had not been changed for twenty-five years. That, however, was not a carcinoma of the cervix.

DR. CAREY CULBERTSON said that possibly our use of the term "precancerous" is abhorrent to the pathologist, and we can spare the pathologist's feelings, by referring rather to atypical cellular proliferation. In these so-called minor lesions of the cervix, the important thing is the histologic diagnosis. One has to know whether there is an erosion or not before he treats it. The only way he can tell is by histologic examination of the tissues. If there is atypical cellular proliferation, the question is whether or not such a lesion is still an erosion. Microscopic examination also settles the question as to whether there is danger from an erosion, and how that danger may best be avoided. This question is not always easy to answer, but he agreed with Dr. Schmitz that there is always a predisposing lesion; cancer does not develop in normal, healthy tissue.

DR. IRVING STEIN asked whether Dr. Schmitz had ever seen a case of carcinoma of the cervix develop in a case of erosion which was treated by linear cauterization.

The present method of treatment by cauterization is extremely popular. This certainly does not cause complete destruction of that tissue. If what Dr. Culbertson says is true, we should see carcinoma develop as a result of cautery treatment.

DR. SCHMITZ (closing) said that the value of the histologic malignancy index lies in two facts: 1. The histologic factors considered are nine; namely, the type of cells, the variation in the size and the irregularities in shape of cells and nuclei, the functional activity of the cells, the distinction of the cell outline, the degree of hyperchromatism and the number of mitoses. 2. The numerical evaluation of these factors. For instance the number of mitotic figures are counted in ten fields with the oil immersion lens. If more than twenty mitotic figures were counted then the value 4 was given; if from fifteen to nineteen mitoses were counted, the value 3; from ten to fourteen the value 2, and for fewer than ten the value 1 was given. Again the irregularity of cells was determined as follows: If 50 per cent of the cells showed irregularity the value 4 was given; if 40 to 50 per cent, the value 3; 25 to 40 per cent, the value 2, and less than 25 per cent the value 1.

The numerous factors and the relative numerical evaluation obviously would permit an evaluation free of subjectivism and relatively free of error. Thereby mistakes are rendered practically unimportant. Those interested may review the original communication in the *American Journal of Roentgenology,* 1926, xvi, 30.

The present state of the high perfection of the technic of abdominal panhysterectomy and the application of radium and x-rays in the treatment of carcinoma of the uterine cervix, both executed by thoroughly trained clinicians, will probably not be improved. The bad results obtained in the treatment of cervical carcinoma are not the results of poor surgical or radiologic technic, but should be assigned to the obvious fact that the patients enter the clinics in an advanced stage of the disease. The five-year cures in the clearly localized carcinomas belonging to clinical Group 1 and having a histologic malignancy index of 20 or less, show a percentage of 65 to 80 per cent of good five-year end-results. Hence, if the patients with uterine carcinoma would enter the clinic when an abnormal discharge is the only symptom, then the cures of carcinoma would rapidly improve. As soon as a cancer bleeds, a breakdown of tissue or an erosion of blood vessels has taken place. Such a cancer shows usually a remarkable extension and must be inserted in the Groups 2 and 3 which means that the chances of a cure are very slight.

Hence any efforts made to induce the patient with a leucorrhea to submit to a careful examination and diagnosis would tend to an improvement of the good end-results. And in this connection Dr. Schmitz called attention to the relation of the chronic cervicitis and the cervical erosion to the so-called erosion cancer. Timely treatment of these diseases, and the repair of traumas caused by labor, certainly mean prophylaxis. Of course there exist also other factors, but those mentioned are probably the most important.

Toneff, M. E.: Conservative Treatment of Genito-Abdominal Tuberculosis in the Female. Gynécologie et Obstétrique, 1926, xiii, 205.

Four cases diagnosed "genito-abdominal tuberculosis" were treated with intramuscular injections of a solution of colloidal iodine. Improvement was rapid, beginning from the first to the third treatment. There was no notable reaction. Relief from symptoms was almost immediate, and cure is reported in three cases, followed for periods varying from two to ten years. The author thinks that this should be the treatment of choice in this condition, as laparotomy has many contraindications

GOODRICH C. SCHAUFFLER.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Radiology

Favreau, Labeau and Bosc: Necessity for the Popularization of Radiography of the Fetus during Gestation. Presse Médicale, Oct. 1, 1924, p. 786.

The consensus of opinion of all workers in this field is that in the first half of pregnancy a positive demonstration of fetal bony parts is an exceptional occurrence. In eleven cases studied before four and one-half months, the authors record six negative and five positive findings, two of the latter before the fourth month. After four and one-half months, all plates were positive. The authors feel that after the fifth month of a suspected pregnancy, one can consider a negative plate as a proof of the absence of a fetus. They hold that radiography is valuable as an aid in the differential diagnosis between tumor (e. g., fibroma) and pregnancy, in the diagnosis of fibroma plus pregnancy, in the differential diagnosis between acute hydramnios and ovarian cyst with twisted pedicle, as well as in the diagnosis of multiple pregnancy, of position and presentation, of fetal malformations (especially hydrocephalus), and even of lithopedion formation in an old ectopic pregnancy (DeLee).

The bony parts are demonstrable chronologically as follows: The vertebral column is shown earliest; then (in order), the base of the skull, the extremities, the cranial vault, the ribs, and finally the pelvis.

The procedure is absolutely harmless to mother and child, and has many clinical applications.

E. L. KING.

Jardin, R.: Diagnosis of Superfetation Based on Radiography. Bulletin de la Societe d'Obstetrique et de Gynécologie de Paris, 1925, xiv, 444.

A thirty-four year old quadripara was delivered of twins, the first of which weighed 3000 grams and the second 1470 grams. The duration of pregnancy from the menstrual history was estimated at eight and one-half months. The pregnancy was of the double ovum type and while the placentas were attached to each other, there were two distinct circulations as proved by injection. The difference in size of the fetuses aroused the suspicion of superfetation. Roentgen-ray pictures were taken to search for epiphyseal centers at the lower ends of the femurs because it is believed that these centers indicate that a fetus is at or near term. These ossification centers were found in the first fetus but not in the second. The difference in weight in the two fetuses indicated to the author that there was a difference in age of about six to eight weeks and this he believes is proved by the fact that epiphyseal centers did not appear in the second fetus until it was six weeks old. The placenta of the second fetus occupied about one-third of the entire placental surface. There was no microscopic examination of the placenta but macroscopically no areas of degeneration were seen which might explain a retardation of development in the second fetus. The author believes this is a case of superfetation.

In the discussion of this paper, Cathala reported a case of twins which had very dissimilar ossification centers, yet he ruled out superfetation because histologic examination of the placentas showed them to be of the same age. Furthermore, in some cases of uniovular twins where there is no doubt that both fetuses are of the same age, there may be found ossification centers which are not equally developed. J. P. GREENHILL.

Jardin, R.: Anatomic and Radiologic Studies of Ossification Centers in the Knee of the Newborn. Gynécologie et Obstétrique, 1926, xiv, 240.

The point of ossification in the inferior epiphysis of the knee joint appears about the ninth month of fetal life. It is always present in a child born at about term. At term it measures 4 to 6 mm. in diameter. The point of ossification of the superior epiphysis of the tibia appears at eight and one-half months, is not always present in the newborn at term and varies from 1 to 3 mm. in diameter. There is a constant relation between the length of the body and the occurrence of the points of ossification and a similar relation, but less marked, between the weight of the child and the degree of ossification.

Every newborn who does not present a point of ossification in the region of the knee, weighing less than 2,000 grams and shorter than 44 cm., has not yet reached the beginning of the ninth month. GOODRICH C. SCHAUFFLER.

Susaki, R.: Roentgenologic Study of Uterine Involution Post Partum. Kinki Fujinkwa Gakkwai Zassi, 1926, ix, 28.

A semisolid mass was made with barium sulphate which was injected into the uterus of 80 healthy puerperae between second and thirty-fifth day postpartum. Roentgen films were made in dorsal and lateral positions in intervals. The following observations were made in these studies: Even thirty days after labor the uterine cavity had not narrowed to its normal lumen but still showed moderate dilation. As compared with the multipara, the cervical canal of the primipara contracted much slower, and even late in the puerperium it was still seen dilated. When cervix and uterine cavity were studied together in the films taken in these two directions, in many cases a rotation could be noticed, to right or left, of uterine body against cervix, outside of changes in anteversion or retroversion. In later periods of the puerperium retroversions were seen more often leading to the conclusion that secondary retroversion develops in the course of the puerperium.

AUTHOR'S ABSTRACT.

Biermer, L.: X-Ray Treatment for Ptyalism of Pregnancy. Medizinische Klinik, 1924, xx, 243.

It is well known that after x-ray treatment, especially in the region of the head, many patients complain of marked dryness of the mouth which persists for some time. This observation led Biermer to use the x-ray in an attempt to check temporarily the function of the salivary glands in a patient with ptyalism of pregnancy.

Before treatment with the x-ray the average fluid intake by the patient was between 1100 and 1300 c.c. The daily urinary output was between 350 and 850 c.c., while the amount of saliva varied from 550 to 800 c.c. daily. The latter figures, though large, do not represent the actual salivary output, for most of the saliva was swallowed. Psychotherapy and atropin were of no avail so x-ray was used. The parotid glands received the most intensive and the sublingual glands the least intensive radiation. There was a very rapid subsidence of the salivation and the patient went to term without any complications. J. P. GREENHILL.

Nürnberger, L.: Irradiation of the Sex Glands and Posterity. Monatsschrift für Geburtshülfe und Gynäkologie, 1923, lxiii, 7.

This article is essentially an answer to Unterberger's paper on the same subject. The latter from experiments on animals came to the conclusion that irradiation of the ovaries produced a diminution in size of the offspring and also a diminution in their fertility. These effects were transmitted to subsequent generations; hence there was, according to Unterberger, transmission of acquired characteristics. Nürnberger bitterly assails Unterberger's data, experimental methods, analyses, etc., and concludes that even were Unterberger's conclusions correct they would not apply to the human being; for it has been definitely shown that in women irradiation of the sex glands does not produce any harm to the offspring.

J. P. GREENHILL.

Schwaab, A.: Again an X-Ray Child. Presse Médicale, 1924, No. 54, p. 566.

The patient, 40 years old, and married 10 years, had never been pregnant. She was found to have a large uterine fibroid. She preferred radiotherapy, which was instituted by a radiologist. In spite of the fact that she had not menstruated for seven weeks, 16 treatments were given over a period of about 3½ months, during which time the amenorrhoea persisted. At this stage a pregnancy of 4½ months was diagnosed by the author. The fetus developed poorly. A day before the calculated date of delivery labor began, and as delivery by the normal passages was absolutely out of the question, a classical cesarean section was performed, followed by hysterectomy. The child weighed 1620 grams, and was 43 cm. long. At the age of 4 months it weighed 2000 grams and gave the appearance of a premature infant of seven months. It was microcephalic, and had convergent strabismus. The prognosis, physically and intellectually, was not good.

The importance of carefully excluding pregnancy before subjecting such tumors to radiotherapy is stressed.

E. L. KING.

Abels, H.: Arrested Development In The Newborn Following Roentgen Ray Exposure During Pregnancy. Wiener Klinische Wochenschrift, 1924, xxxvii, 36.

The author reports the case of a quadripara who gave birth to a full-term baby on April 11, after having received Roentgen ray treatment for uterine bleeding during the preceding September. As evidence that the baby was full-term, he cites the fully developed nails, well developed and descended testes and the absence of lanugo. The baby was 41.5 cm. long and weighed 1950 gms. The head was typically microcephalic, there was double microcornea and microphthalmus. The penis was only 4-5 mm. long and contained no corpus cavernosum. The muscles of the lower extremities were slightly spastic. X-rays of the long bones showed changes suggestive of syphilis, but all other signs and symptoms of syphilis as well as the Wassermann reactions were negative.

The author compares this case to those reported by Aschenheim, Werner, and others who also felt that such deformities were due to x-ray exposures during early pregnancy.

RALPH A. REIS.

Driessen: Is the Child in Utero Injured by Roentgen Radiation of the Mother? Nederlandsch Maandschrift voor Geneeskunde, 1924, xii, 239.

Driessen feels that the evident difference between damage to the follicle or the ovum before its impregnation and that suffered by the embryo, has not been sufficiently emphasized. While Nürnberger concluded that the germinal cell is either entirely destroyed by the x-ray or escapes injury altogether, Driessen's experiments on animals seem to prove the opposite. He found that while an ovum may retain enough vitality to become fertilized, it may nevertheless be permanently damaged. He found that the development of the embryos in rabbits which had been subjected to radiation was unmistakably interfered with. The duration of pregnancy in these animals was prolonged and the offspring below par. This agrees with the observations of Werner who found that women who had been irradiated before conception, frequently aborted and, in those cases where viable children were born, these had a tendency to lag in psychic and, more especially, in physical development.

That the embryo itself may be injured by the x-ray had already been pointed out by Perthes who claimed growth defects, malformations and monstrosities resulted from roentgen radiation of the embryo. Hertwig and his collaborators demonstrated that the exposure of frog embryos in the morulla stage to radium caused either gradual death or deformity of the central nervous system, depending upon the dose. Radiation in the gastrula stage caused spina bifida and other changes in the nervous system and blood. Most of these died a few days after maturity. Driessen exposed one side of pregnant rabbits to the x-ray. Invariably this produced death of the embryos in the radiated horn without any demonstrable histologic changes of the uterus or the corpora lutea.

While it has not been demonstrated that a single exposure, as used in making an x-ray picture of a pregnant woman, has any deleterious effect upon the fetus in utero, Driessen cautions that the making of repeated exposures may not be without definite danger to the child. He holds that therapeutic doses should only be given in urgent cases, such as in the treatment of carcinoma, and then with the distinct understanding that the fetus will probably be sacrificed.

R. E. Wobus.

Martius, H., and Franken, H.: Damage of the Offspring of White Mice, Radiated before Mating. Zentralblatt für Gynäkologie, 1926, 1, 25.

Carefully selected, healthy white mice were subjected to x-rays about eight days before mating. The total number of offspring was reduced to less than half. Mortality of the offspring was greatly increased, growth and development definitely impaired. All were sterile after nine months, whereas all control animals, mated at four months, gave birth to normal litters later. These experiments made on mice do not prove anything in regard to the human being, but the possibility of similar damage to the human offspring by radiation without permanent sterilization is strongly suggested. Grover Liese.

Schiller, W.: Full Term Pregnancy Following Roentgen Irradiation. Wiener Klinische Wochenschrift, 1924, xxxvii, 1190.

The author reports a case of a full term pregnancy following x-ray irradiation for myomata. The patient was 43 years old. During the puerperium she developed a temperature due to necrosis of the myomata, necessitating a supravaginal hysterectomy which was followed by an uneventful recovery. The baby has, up until the present time appeared normal in both its physical and mental development.

The author feels that this successful gestation was brought about by the x-ray therapy. The radiation resulted in the establishment of a normal endometrium which was able to maintain gestation once implantation took place. He feels that, if a reliable stimulating dosage of x-rays could be determined, many cases could become pregnant following such treatment, where no pregnancy could otherwise take place due to the presence of pathology of the endometrium.

Ralph A. Reis.

Naujoks, H.: Injuries to the Child Due to Roentgen-ray Therapy. Monatsschrift für Geburtshülfe and Gynäkologie, 1924, lxviii, 40.

In September, 1921, a patient had an ovarian sarcoma removed and had roentgen-ray treatments after the operation for a long period of time. One or more treatments were given before it was discovered that the patient was pregnant. In August, 1922, the patient had a spontaneous labor without any complications. The child weighed 7 pounds and appeared normal. One year later, however, the child was underdeveloped and its head measured 39 cm. instead of 46 cm. In April, 1924, the patient gave birth to another child (her third). This child like the one born before the radiation was normal. The author believes therefore that in any case where in the early months of pregnancy large doses of roentgen-rays have been applied, abortion should be performed because the fetus is usually damaged.

J. P. GREENHILL.

Lüttge, W.: Indications for Temporary Roentgen-Ray Castration. Monatsschrift für Geburtshilfe und Gynäkologie, 1925, lxx, 306.

Up to the present time there is no practical operative procedure which will produce temporary sterility. Hence attention has been directed to the x-ray. The corpus luteum is the most resistant part of the ovary to the x-ray and the primordial follicle is more resistant than the graafian follicle. The accepted dose for temporary castration is 24 per cent of the skin dose. But changes in position of the ovaries of only 1 cm. may result in a dose of 30 to 32 per cent. Since 34 to 36 per cent is sufficient to produce complete and permanent castration, it is readily appreciated how careful one must be and how strict the indications for the use of x-ray should be made. Another disadvantage is the inability to measure exactly the depth of the ovaries. Furthermore the ovaries have a constantly changing blood supply which prevents exact dosage of the x-ray. For these reasons the author cautions against the use of the roentgen ray for purposes of castration.

J. P. GREENHILL.

Blacker: The Treatment of Menorrhagia by Radium. Lancet, 1923, cciv, 421.

Radium can be used for the treatment of menorrhagia in three conditions, viz., cases in which the bleeding is associated with the menopause, cases in which it is due to the presence of small fibromyomata in the uterus, in cases in which it occurs in young women who present no signs of general or pelvic disease. All these cases can be safely and sufficiently treated by the intrauterine application of radium, and this should always be employed in preference to any other measures when radium is available.

It is important to note that a sufficient number of cases of pregnancy with the birth of healthy children after the use of radium in young women have been reported to show that when the periods return normal pregnancy may occur, and that there is no evidence that the children of such pregnancies are more likely to be maldeveloped or deformed, although monstrosities can be produced in animals exposed to radium in the early weeks of pregnancy.

NORMAN F. MILLER.

Naujoks: Temporary Sterilization by the Roentgen Ray. Zeitschrift für Geburtshülfe und Gynäkologie 1923, lxxxvi, 638.

He believes with Pankow that the resumption of ovarian activity following temporary cessation after a roentgen exposure is due to the ripening of undamaged primordial follicles rather than a restoration of slightly damaged follicles or a resumption of activity by the germinal epithelium.

There are four possible objections to the use of the x-ray as a means of temporary sterilization: (1) severe castration symptoms in young individuals, (2) lasting damage to ovarian function, (3) disturbances or abnormal course of future pregnancies, (4) damage to the offspring.

The last two objections are by far the most important, and the whole question of temporary sterilization rests on the fate of the later offspring. Experiments with radiation of the ova and spermatozoa of eels and frogs, showed serious malformations. Experiments with mammals showed greater danger of abortion but never malformations. Human cases are as yet comparatively few. Werner in 1921 collected 24 pregnancies after radiation. There were no malformations but possibly an increased tendency to abortion. Later observation of some of the children, however, suggested retardation of development; and although this may have been constitutional or accidental, final conclusions cannot be drawn until a considerable series of such children are followed to adult life and reproductive activity.

MARGARET SCHULZE.

Gauss: Can a Temporary Roentgen Amenorrhea be Established Uniformly and by Rule? Zeitschrift für Geburtshülfe und Gynäkologie, 1924, lxxxvii, 453.

The writer's conclusion from animal and clinical experiments is that while the developing follicles are killed and the nearer maturity they are, the more easily the primordial follicles are either uninjured, in case of small doses, or also killed, in case of larger ones, but never crippled, a fact of the utmost importance in the decision as to the advisability of attempts at temporary sterilization.

From the careful study of cases in which temporary amenorrhea of varying duration has been induced, others in which the amenorrhea has been permanent, and still others in which menstruation has merely been influenced temporarily, the author has been able to establish fairly definitely the relation between the necessary dose, the duration of amenorrhea desired, the age of the patient and the type of disease. He has compiled tables which state this relation, and although many further observations will be required to make them accurate, he feels that in time very definite dosages may be established for the individual patient.

MARGARET SCHULZE.

Watkins, Thomas J.: Radium for Non-Malignant Gynecologic Diseases. Wisconsin Medical Journal, 1924, xxiii, 123.

The author gives his experiences with radium in 1050 cases.

He summarizes as follows:

Radium is a specific remedy for the hemorrhage of the menopause and is the remedy of choice for selected cases of uterine fibroids. It will cure some 80 per cent of obstinate cases of chronic cervical erosion with leucorrhea.

Radium should be used with caution in the young, lest the ovaries be damaged and the fetus deformed in case of pregnancy. Burns can be avoided, as with the x-ray, by care relative to dosage and screening. F. J. SOUBA.

Jones, Thomas E.: The Rôle of Radium in Benign and Malignant Tumors of the Uterus. Wisconsin Medical Journal, xxii, 1924, 466.

In the Cleveland Clinic at the present time all cases of carcinoma of the cervix are being treated with a combination radium and deep x-ray therapy. Carcinoma of the fundus should be treated by surgery. Fibroids associated with pain in the pelvis or with discharge from the uterus, the cervix being normal, should not be radiated. Radium is the treatment of choice for menorrhagia at any age; it is especially indicated in cases of menorrhagia at the menopause with slight enlargement of the uterus.

F. J. Souba.

Martindale, Louisa: Treatment of Fibromyomas of the Uterus and other Causes of Menorrhagia. Journal of American Medical Association, 1924, lxxxiii, 1057.

The writer reports his results in the treatment of fibroids, fibrosis uteri and climacteric hemorrhages; 126 were treated operatively, 87 with intensive roentgen-ray therapy. Ninety-five and five-tenths per cent of the cases treated with roentgen ray resulted in cure. The failures were operated on, but nothing accounting for the failure could be found. The author concludes that as long as one's diagnosis necessarily remains faulty, there is a certain danger in using extensive roentgen-ray therapy for any but those cases in which we are fairly certain that we are dealing with an uncomplicated case, e.g., a fibroid uterus well under size of a six months' pregnancy, interstitial rather than subperitoneal. In all cases that are at all doubtful in diagnosis, operative treatment is advised.

Grover Liese.

Nemec, Elo: X-Ray Results in the Treatment of Fibroids and Uterine Hemorrhages. Bratislavske Lekarkse Listy, 1925, v, 12.

Such treatment consists either in direct or indirect application of the rays, either directly to ovaries or uterus, or indirectly to spleen, hypophysis and thyroid. Direct treatment was resorted to in all cases of uterine fibroids. Indirect irradiation, advocated by some writers, for the treatment of fibroids was not used because the results so far reported in literature are far from encouraging.

Out of a total of 53 cases of uterine hemorrhage, in 36 both ovaries, in 11 the spleen, and in 6 but one ovary were radiated. Ovarian treatment is a reliable method but should be done in younger women with greatest care since it might result in sterilization. The result of unilateral ovarian irradiation depends only upon the fortunate selection of the correct side. Spleen treatment does not seem to act as a specific; and though it acts quickly, the effect is but short lived.

Author's Abstract.

Benthin, W.: Limitations and Dangers of Conservative Therapy in the Treatment of Gynecologic Ailments with Special Reference to Roentgen-Ray Therapy. Medizinische Klinik, 1926, xxii, 719.

The conservative treatment of pelvic inflammations is not always successful, regardless of whether the therapy consists of local heat, protein injections, baths, etc. The same holds true for the treatment of certain gynecologic ailments by means of psychotherapy.

The largest proportion of failures is obtained in the treatment of disorders of the endocrine glands. This is most likely due to the fact that the symptoms of an endocrine disturbance such as leucorrhea, dysmenorrhea, menorrhagia, amenorrhea, sterility, etc., are considered to be of endocrine origin only when all other etiologic factors have been exhausted. Even roentgen-ray therapy has done very little good, and in many instances it has done harm. In outspoken cases of hypoplasia, no improvement has been produced by the x-ray and even in cases of climacteric hemorrhages serious bleeding recurs very frequently after treatment.

The dangers from the Roentgen ray are numerous and not all are known. Aside from the damage to the skin and to the intestines from an overdose, there are other dangers. Numerous examinations of the blood have shown that the general reaction does not parallel the indicated dose but is dependent upon the activity of the blood-forming organs. Even concerning the action of the Roentgen ray on the ovaries very little is definitely known. We cannot determine beforehand whether the function of the ovaries will be entirely destroyed or only temporarily discontinued.

Because the dosage of the x-ray cannot be determined with accuracy due to the difference in individual reactions and because damage cannot always be avoided, we should employ x-ray treatment only for strict indications. Before using the Roentgen ray one should make certain the patient is not pregnant because the fetus can be injured. The only real general contraindication to x-ray treatment is severe anemia because the styptic effect of radiation does not manifest itself until sometime after treatment. J. P. GREENHILL.

Tuffer, Th.: Attempted Protection of the Ovaries (Occultation) in the Treatment of Uterine Fibroids by the X-ray. Presse Médicale, Nov. 24, 1926, p. 1473.

The ideals to be attained in x-ray therapy of uterine fibroids are: (1) to cause regression of the growth; (2) to stop the hemorrhages; (3) to cure the patient while conserving the ovarian function and the uterine mucosa, the latter of particular importance for young women. In an attempt to meet these requirements he has devised the following method:

Laparotomy is performed. If exploration demonstrates the impossibility of enucleation of the tumor or tumors, the ovaries are enclosed in hinged, egg-shaped lead shells, with walls 0.003 mm. thick, having a fissure at one end large enough for the free passage of the vascular pedicle. These shells are reinforced with a layer of aluminum, and on the free border are little orifices which permit the halves of the shell to be sutured together and to be fixed to the broad ligament or to the uterus. The abdomen is closed and a skiagraph taken later. The position of the shells serves as a guide to the employment of the x-ray. After the series of radiotherapeutic treatments is concluded, the lead shells are removed by a second laparotomy; this is the chief disadvantage of the method. The author notes that possibly other radiosensitive organs, e.g., the suprarenals, may be protected in a similar manner when neighboring organs must be radiated.

Three patients have been treated by this method. The first attempt was a failure; the growth increased in size, and myomectomy was required three months later. The menorrhagia, however, had been controlled. In the other two patients the menorrhagia was still under control at the end of a year, but there was little or no diminution in the size of the tumors.

The number of cases in which this method is applicable is small.

E. L. KING.

Wielach: Stimulative Roentgen Radiation of the Ovaries. Zeitschrift für Geburtshülfe und Gynäkologie, 1924, lxxxvii, 1.

The authors began the use of very small doses (1/5 to 2/5 of the castration dose) of x-ray in a series of cases of ovarian hypofunction. In seven cases of primary or secondary amenorrhea there was no result. In two cases slight menstruation appeared many months after the radiation, too long to be regarded as a certain result of it, but at least indicating that in these cases 1/5 of the castration dose had done no damage. In the second group of oligomenorrhea (irregular and infrequent slight menstruation), only one of seven cases showed permanent improvement, one was temporarily benefited, three were made worse, two were not influenced. The age in these cases seemed to play no rôle, and as far as dosage went, 1/5 of the castration dose seemed as likely to harm as 2/5 to benefit.

The third group of hypomenorrhea (regular but scanty menstruation) comprises 11 cases, of which some were radiated as often as five times, the dosage being from $\frac{3}{10}$ to $\frac{3}{5}$ of the castration dose. Two cases showed no result, eight were improved, one made worse. Three of these cases have been under observation less than a year, hence the permanent result cannot as yet be stated. It appears though, that the more marked the hypofunction, the more difficult it is to influence it favorably, and the easier it is to completely damage the slight function present. Cases must, therefore, be carefully individualized; and where no results are obtained with slight dosage, further treatment should not be undertaken.

MARGARET SCHULZE.

Hirsch: Further Experience in Radiation of the Hypophysis. Zentralblatt für Gynäkologie, 1924, xlviii, 76.

Hirsch is unable to confirm Werner's opinion that small dose radiation of the hypophysis influences favorably amenorrhea, dysmenorrhea and climacteric conditions; although he considers these results very probable. Similar favorable results may be obtained through other measures without the dangers incident to radiation. He is unable to prophesy any therapeutic future for this form of radiation; although experimentally as an aid to determining relations between the hypophysis and other endocrins, and occasionally for influencing the vegetative center in the floor of the third ventricle, and for demonstrating the multiform relations between hypophysis and genitalia, it is important. There is need of further proof whether the radiation works directly on the hypophysis and thereby influences the center by means of secretion induced, or whether the influence is directly on the center itself.

LITTLE.

Items

JOINT COMMITTEE ON MATERNAL WELFARE

A meeting of the Joint Committee on Maternal Welfare was held in Detroit, October 3 and 4, 1927, representatives being in attendance from all of the constituent bodies. The Chairman, Dr. Fred L. Adair, presided. The two sessions were largely given over to a study and discussion of "Standards of Intrapartum Care," prepared by Dr. W. C. Danforth, of Evanston, Ill. It was resolved to publish these in pamphlet form for distribution to the medical profession through various sources, similar to the "Standards of Prenatal Care" previously circulated. A pamphlet on postpartum care along the same lines is likewise under preparation.

WOMANS HOSPITAL, NEW YORK

The following promotions on the surgical staff are announced:

Dr. Dougal Bissell, who has retired on account of the age limit, was made Consulting Surgeon.

Dr. Byron H. Goff, Attending Surgeon.

Dr. Lilian K. P. Farrar, Attending Surgeon.

Dr. Albert H. Aldridge, Junior Attending Surgeon.

Dr. William P. Driscoll, Adjunct Assistant Surgeon.

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Original Communications

THE OVARY IN OSTEOMALACIA*

By John R. Fraser, M.D., Montreal, Quebec

OSTEOMALACIA has long been regarded as a disturbance of metabolism peculiar to the female sex, usually found in pregnancy, or at least brought to its fullest development, by the influence of pregnancy. In this disease, the lime salts are abstracted from the bones, first and most noticeably from those of the pelvis, and only in more advanced stages from other bones, the results being curvature and deformity of the pelvis and other bony structures. Fractures appear readily; simultaneously there occur, genetically coordinated, inflammatory, degenerative processes in the nerves and muscles. These latter changes play a striking part in the clinical picture of osteomalacia.

Osteomalacia, as a rule, appears sporadically, but in certain localities it exhibits endemic characteristics, particularly is this so in Japan, Switzerland, southern Germany, and Austria. In these countries its appearance is of frequent occurrence even in certain domestic animals, whereas it is extremely rare in Canada and the United States, especially in its active or developmental stages. These facts show that there is a local exogenous condition which has not been sufficiently recognized, and which plays some part in the origin of the disease; a rather similar state of affairs appears to be true of exophthalmic goiter. Modern opinion leans rather to the theory of osteomalacia being due to a complex pluriglandular disturbance of internal secretion, the chief lesion being in the ovary.

Ever since castration was introduced by Fehling in 1887 as a cure of the condition, offering, especially in puerperal osteomalacia, 93 per cent of cures, the problem presented has been how and in what way can a lesion of the ovary influence the disease of the bone, and what could the nature of this lesion be?

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*Read by invitation at a meeting of the New York Obstetrical Society, March 8, 1927.

Note: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

Some progress in the elucidation of this disease has been made by attempting to dissociate the predisposing factors from the particular cause of osteomalacia. Damp houses, unhygienic conditions, lack of meat, water poor in lime, long continued lactation, may alter the balance of the metabolic processes, so that from these causes, or from another as yet unknown to us, a loss of lime salts takes place.

The close bearing of pregnancy on the cause of the disease is of importance. At first sight it might appear that osteomalacia predisposes to frequent pregnancies, and there is available evidence in seeming support of such a contention; the balance of opinion, however, would rather lean to the feeling that frequent pregnancies aggravate the osteomalacia, as even menstruation is known to cause an exacerbation of the symptoms, and the clinical course of the disease is certainly not influenced for the better by repeated pregnancies. The congestion and excessive functioning of the pelvic organs, together with the necessary loss of calcium and phosphorus, play no inconspicuous part in the course of the disease.

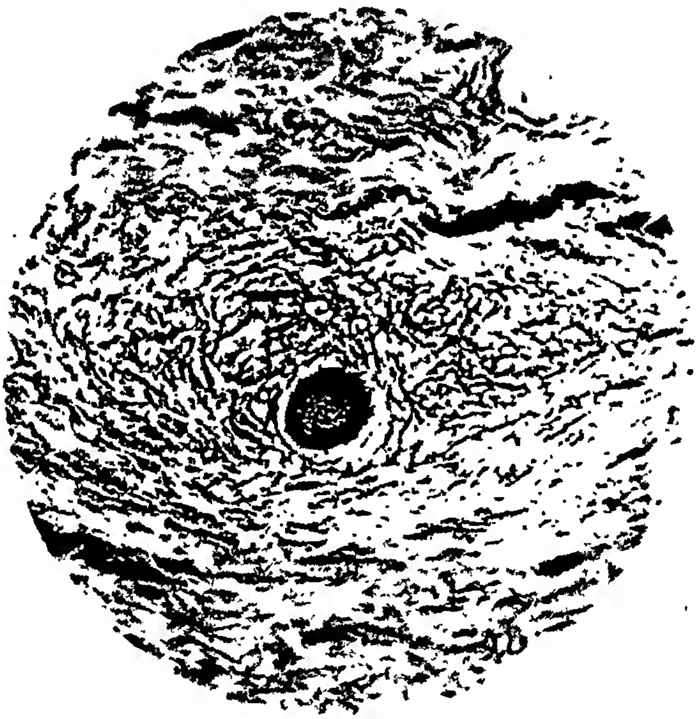

Fig. 1.—Section of osteomalacic ovary showing early degeneration of a primordial ovum. The marked epithelial overgrowth about it is a conspicuous feature.

It has been observed by many, among others by Fränkel of Vienna, that the removal of one of these predisposing factors, such as the drainage of any marshy area consequent upon industrial development, has as its immediate result the cessation of the disease in that locality. Surely this fact denies the existence of any simple cause.

Much work has been done, notably by Moussu and Charrin, Archangeli, Levi and others on the etiologic connection of a special bacterial origin of the disease, and experimentally by injections of marrow from infected patients they were able to produce in animals, lesions similar to osteomalacia. Some color is attached to this hypothesis by reason of the sporadic outbreaks of the disease in certain localities. The greatest argument, however, against there being any bacterial origin of the disease, comes from the demonstrations and views of Fehling, who cured the disease by castration.

The ovaries undoubtedly exert a marked influence on phosphorus metabolism, and the improvement which occurs after the removal of these organs in cases of osteomalacia may be brought about by a retention of the earthy phosphates, whereby the skeletal tissues again acquire their normal rigidity. Unfortunately the experimental work which has been done so far on phosphorus and calcium metabolism in normal and castrated animals, is too contradictory to admit of the deduction of any conclusions calculated to throw light on the phenomenon of osteomalacia.

Blair Bell quotes a 50 per cent reduction in calcium excretion after ovariotomy, and with this he correlates the fact that in young animals there is generally increase in the long bones after ovariotomy. He also observes the retention of calcium and phosphorus after oophorectomy in humans.

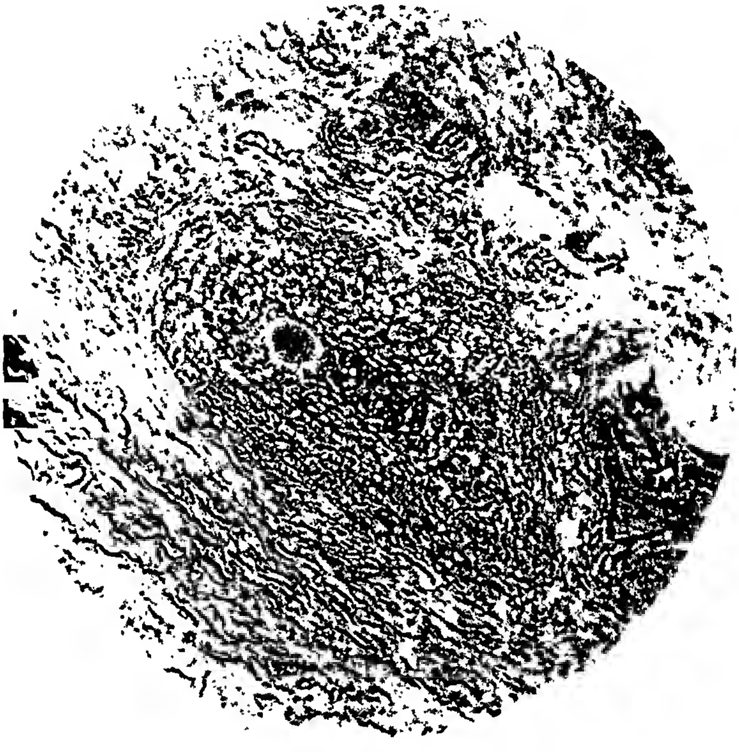

Fig. 2.—Early follicle formation. Coincident with intrafollicular degeneration there is well-marked perifollicular cellular hyperplasia.

It is of some significance that Sellheim, Tandler, and Gross observed that in castrated animals and eunuchs, the medullated bones showed a longitudinal growth.

At this point it is interesting to record the findings in the ovary of a patient who had received roentgen-ray treatment as an experimental attempt to promote castration. Wallart states that this patient was radiated in 1914, and was indifferently well until 1916, when radiation was again tried only to fail, so that castration was resorted to. Here the ovaries showed extensive interstitial gland formation and marked ovarian activity, although ovulation had apparently ceased and the follicles were all atretic. The outstanding feature was the presence of marked interstitial gland tissue. Castration was followed by cure.

It was Fehling's belief that in osteomalacia we are concerned with a trophoneurosis of the bones connected with the genitals and dependent on the changes of the ovary.

Krönig and Pankow report a case where they removed the ovaries and reimplanted one in the pouch of Douglas. So long as the menses were withheld, improvement was noticed, but immediately they recurred with the taking of graft, the symptoms also returned, and the ovary had eventually to be removed.

Since the investigations of the histology of the ovary were apparently unsatisfactory, the attention of investigators naturally turned to other directions, and the several endocrine glands were each considered in turn.

Inasmuch as thyroid disorders are associated with bony changes, it is only natural that it should be considered in this connection, and much evidence was adduced to show the similarity between goiter and osteomalacia with respect to distribution and manifestations, but the treatment based on these lines never gave results. Moreover, Zunz has shown the absence of any change in the metabolic rate in osteomalacia, and also drew attention to the fact that in both Basedow's disease and myxedema, osteomalacia has been known to occur.

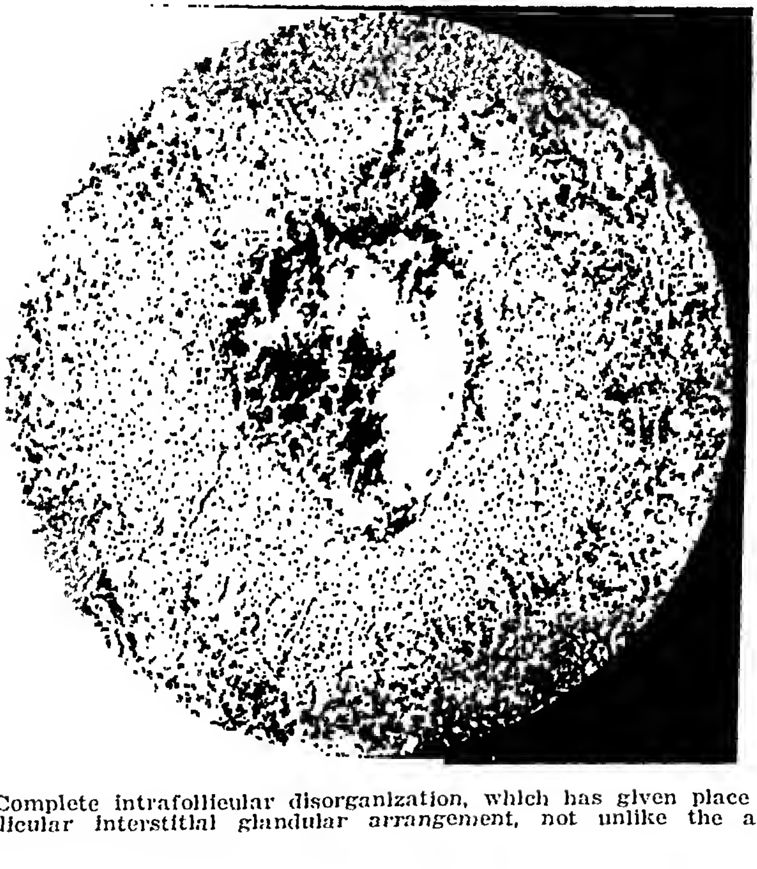

Fig. 3.—Complete intrafollicular disorganization, which has given place to a distinct perifollicular interstitial glandular arrangement, not unlike the adrenal in appearance.

Hofmeister attempted to show a relationship with thyroid insufficiency. Pause removed the thyroid gland in pregnant rabbits, inducing bony changes, and advised thyroid extract in osteomalacia, but no definite results followed.

Erdheim and others have shown some changes in the parathyroid gland in osteomalacia but have produced no conclusive findings or beneficial therapy.

Bossi of Geneva, in 1907, drew attention to the value of adrenalin in the treatment of osteomalacia. No definite results came of the suprarenal theory beyond developing the idea that possibly the adrenalin neutralizes the hypersecretion of the ovary by its vasomotor effect overcoming the existing vasodilatation.

A very determined effort has recently been made by Scipiades to connect the etiology of osteomalacia with changes in the thymus gland. Tandler, Klose, and

Matti extirpated the thymus gland in young animals and found as a result that the bones were shorter, their weight less, their consistency soft, flexible, brittle, and easily fractured, and finally that as a result of diminished ossification there was scanty callus formation with cysts in the callus.

Although a physiologic involution of the thymus gland is known to occur in puberty and later life, certain so-called accidental involutions occur from time to time in midsexual life, and are of interest while considering the etiology of osteomalacia. For example, in pregnancy a definite atrophy occurs, while in the puerperium an active hyperplasia takes place, and the organ is generally restored. Similar atrophies are known to occur in acute and chronic infections, cachectic processes, and following roentgen-ray exposure. The chief interest lies in the fact that coincident with thymic atrophy there is a delay in ossification. When the thymus gland is removed experimentally there is very little change in the genitals and little or no ovarian activity, whereas on the contrary castration is followed by great thymic enlargement.

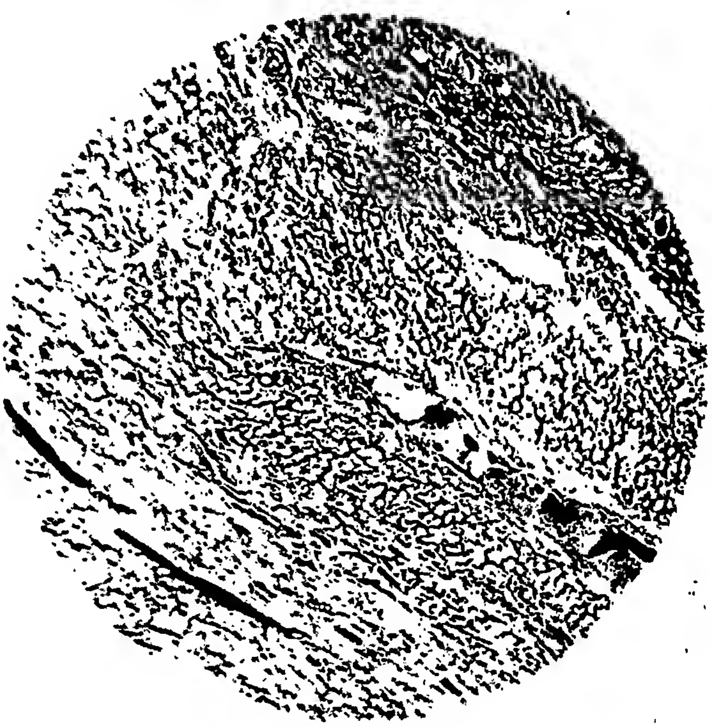

Fig. 4.—A cortical interstitial gland formation showing collapse of follicle as the result of pressure. The perifollicular gland formation is actively represented.

Even though Scipiades has produced bony changes in animals by removing the thymus gland it must be remembered that he did so in young animals in the growing stage, and also that he was unable to reproduce the increase in the genital activity which is a clinical fact recognized by all workers in the field.

We are encouraged by these experimental failures to turn again to the ovary, in the hope that, as a result of more recent developments, some light can be thrown on the state of the ovary, and on the interpretation of changes there.

With the advent of castration into the therapy of the disease there have naturally been countless histologic researches undertaken on the extirpated ovaries. The results have been many and varied; a definite hyperemia, sometimes hyaline degeneration of vessels, or a high degree of friability have been observed at times, but as these are appearances which have been noticed in other conditions, they cannot be said to possess any great significance. The only real light which has so far been cast on the subject has been contributed by Wallart who has drawn attention to the development of the so-called interstitial gland tissue scattered through the ovary.

The admirable observations of Limon and Bouin have clearly depicted for us the meaning of the so called interstitial gland of the ovary. In anatomic nomenclature what is generally understood by the term "interstitial tissue" is the ordinary interstitial or connective tissue which forms the stroma of most of the organs, and acts as a substratum to the various separate elements, which grouped together are called parenchyma. The parenchyma is very naturally the most characteristic element of an organ and differs in each one. The interstitial tissue, on the contrary, shows very few variations in its structure, being always of a supporting character, fibers and cells. In the ovary the distinction between the two tissues is established from the beginning; the elements of the parenchyma, the covering epithelium, the graafian follicles, to which are added the yellow bodies and the medullary fasciculi, all the rest of the organ being interstitial tissue. Later, however, there are found among this tissue new elements very different from those usually present; these are voluminous cells of a polyhedral shape often filled with a fatty substance and bearing no relationship to the stromal cells.

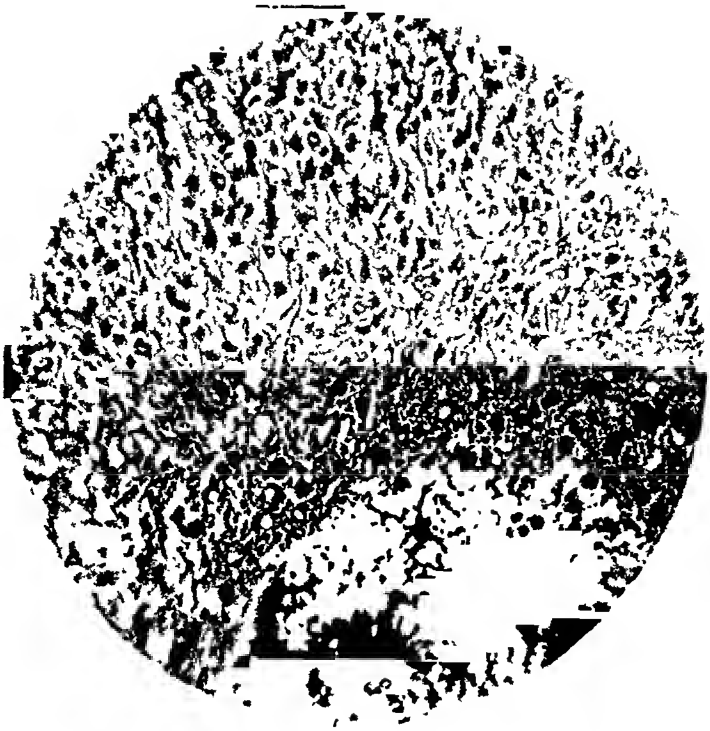
Fig. 5.—Section showing the edge of an atretic follicle with a segment of the perifollicular hyperplasia illustrating the extreme depth of the epithelial proliferation.

Similar cells are recognizable in the connective tissue of the testicle, and the name given to both is "interstitial cells."

It would seem according to Limon that the false yellow body, or as Koelliker prefers to call it, the atretic yellow body, has not the same destiny as the true, these latter being really ephemeral, while the atretic yellow bodies are destined to form the true interstitial tissue. His, in describing these cells in animals, believes that it is erroneous to say that they are degenerative signs, because they always appear in areas richly supplied with blood vessels, and in my own series a vessel always lies in the center or thereabouts.

It is a fact observed in animals, that the interstitial cell tissue, contrary to former beliefs, is not subordinate to follicle activity, as Plato would have us believe, but that the sections rather show the follicles replaced by interstitial tissue. The vascular arrangement of interstitial tissue is very suggestive of secretory activity, and rightly or wrongly Bouin styles this an interstitial gland.

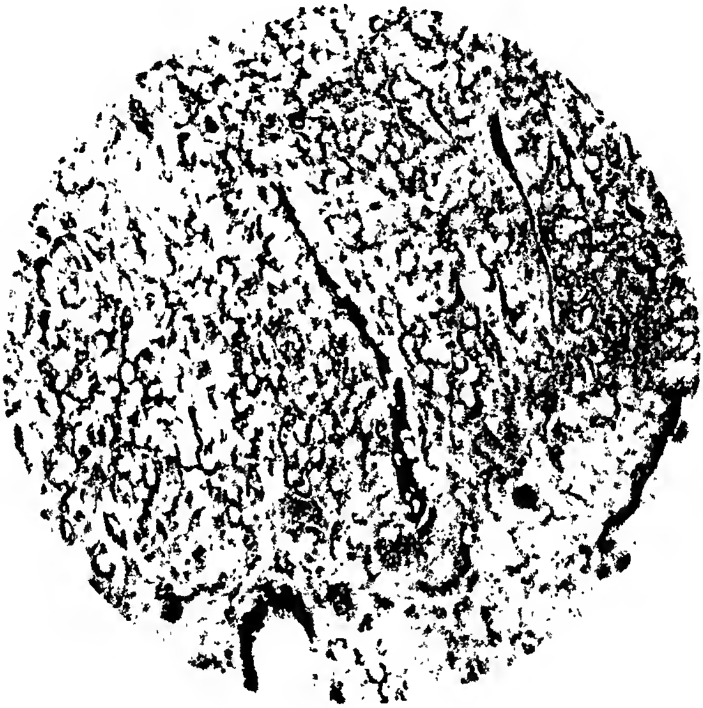

Fig. 6.—The vascularity of these interstitial gland formations is, like other endocrine glands, very evident. Note the large vessel lying in the midst of the gland columns.

The microscopic findings in these ovaries of osteomalacia are often very variable and if one reviews the reports of the innumerable histologists in this field, a great variety of results are encountered. Many observed follicular activity, others marked follicular inactivity; some, follicle atresia and interstitial gland activity. In all, a certain definite increase in vascularity is remarked, and in many the appearance of a decidua-like tissue especially in the medulla is noted, together with very marked areas of hyalin degeneration scattered here and there in both the cortex and the medulla.

Many attempts have been made to reconstruct an osteomalacic ovary, one whose features would suit every case by the constancy of its findings but no very characteristic picture has been evolved.

The specimen which I have had the privilege of studying was removed from a young woman in midpregnancy, who developed a well-marked osteomalacia with characteristic bony changes. Prompt castration led to a cure of the condition. I am indebted to Professor Oskar Fränkel, of Vienna, for the specimen.

The interest in this case lies not only in the somewhat striking appearances present, but in the results of comparison with ovarian hyperplasia in other conditions. I shall therefore confine myself to a report of observations in the first place on the malacic ovary and then in the changes found in the ovaries of two young women who suffered from severe hemorrhage of the so-called idiopathic variety.

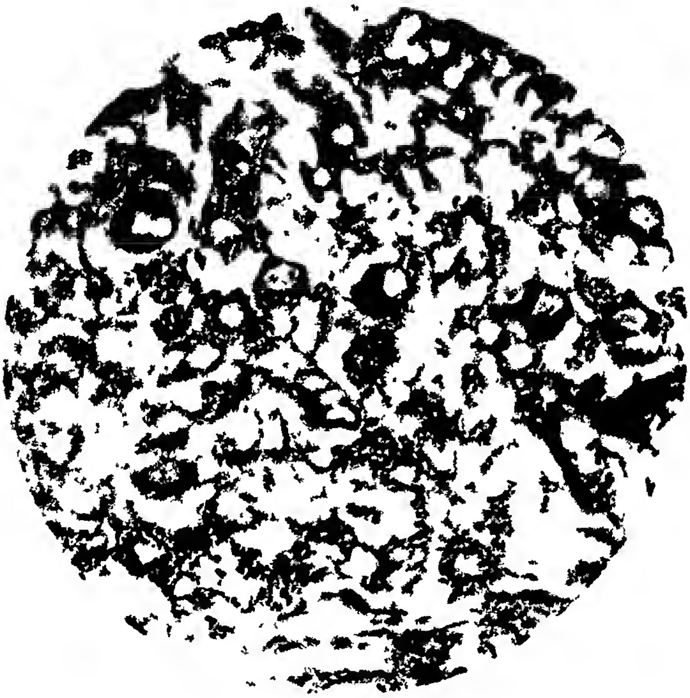

Fig. 7.—Interstitial gland cells under higher magnification.

The ovaries have been prepared in the usual manner, following formalin fixation, serially cut, and stained with hematoxylin and eosin. Frozen sections were also made and stained with Sudan, *scharlach r*, etc.

In the osteomalacic ovary, the cortex and in fact the entire ovary is in a great state of excitation, all the glandular and interglandular tissues are hyperplastic and there is a very marked and universal congestion throughout the ovary. The presence of widespread follicle formation is at once apparent; the ovary contains many small cysts dotted here and there throughout the organ. All stages of follicle development from the smallest primordial follicle to several fullblown graafian follicles are demonstrable, but throughout them all there are evidences of degeneration within, plus a well-marked hyperplasia of the thecal cells without. A dropsical swelling of the primordial follicles is very clear, the nuclear matter shows degeneration, and the usual garland of cells about the periphery is firmly pressed against the stroma, as though the follicle had been overfilled with fluid. In the larger graafian follicles few perfect examples of the typical mature follicle are to be found; changes of a degenerative character are everywhere manifest, which is a distinct contradiction to the picture one would expect in pregnancy. The ovum, when present, invariably shows degeneration; the nucleus may be fragmented or missing; the zona pellucida about it is thickened and hyaline, and often the discus proligerus is greatly enlarged. The cells in the discus are closely packed together; the vascularity is well marked, and the granulosa layer is everywhere in a hyperplastic state. Slavjanski's membrane is clearly marked. The theca is slightly increased and the cells are transformed into masses or cords of closely packed polygonal-shaped cells with large, often eccentrically placed, nuclei and large cell bodies. At times this thecal proliferation is confined to one side of the follicle, but there are also instances where, in a uniform thickness it may be seen encircling the follicles. It is a point of some value that so many maturing follicles should be visible in pregnancy. The corpus luteum of pregnancy is very well shown, the chief appearances are those of beginning involution; there is only a slight thecal hyperplasia which is not always uniformly distributed. Atretic follicles of widely varying appearances are everywhere visible and are represented by large cysts, small cysts, and even by mere slits lying transversely in the deeper layers.

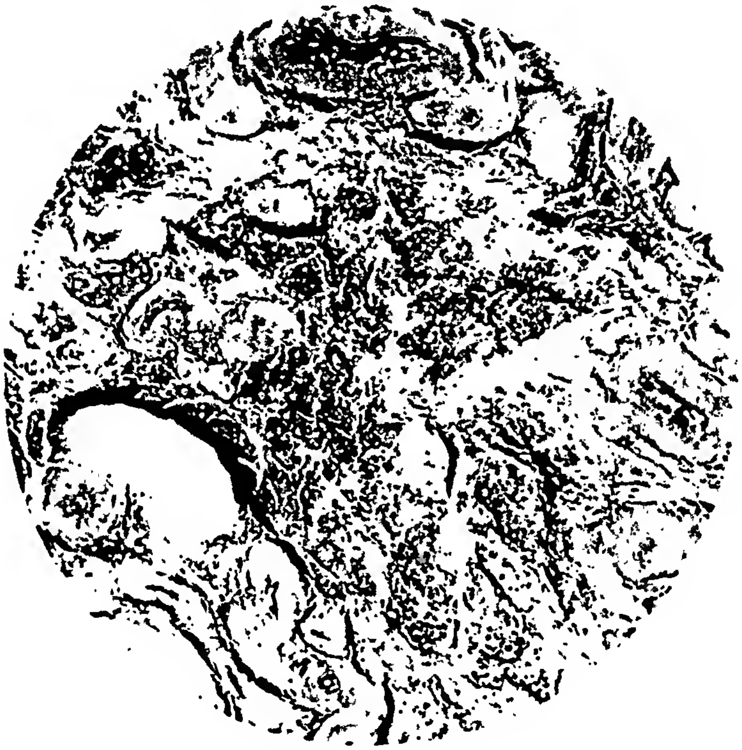

Fig. 8.—Showing the almost telangiectatic appearance of the medulla due to excessive vascularity of the ovary. The relics of gland formations are seen in the center, suggesting the origin of the vessels.

Much interest must of necessity center about the thecal cell proliferation of these atretic follicles,—the structures which have been variously described as false yellow bodies (Bouin) or interstitial glands. We can at once recognize the presence of voluminous cells of a polyhedral shape, often full of a fatty substance, lying in the cortex free or distributed about these atretic follicles. They bear no apparent relationship to the ordinary stroma cells.

There is not sufficient evidence to lead me to agree with Schroen (Limon) that these formations which occur mostly in the medulla and penetrate into the cortex about the follicle zone are derived from the complete breaking up of the yellow bodies and only assist in the formation of cortical structures. They are themselves definite formations.

Tourneux and Bouin, working on lower animals, are very pronounced in their views on the interstitial gland development, and believe that these interstitial cells of the ovary are very like the similar cells of the testicle, particularly directing attention to the apparent physical resemblance between interstitial cells of testicle and ovary, lutein cells of the yellow bodies, and cells of the uterine mucous membrane which form the decidua.

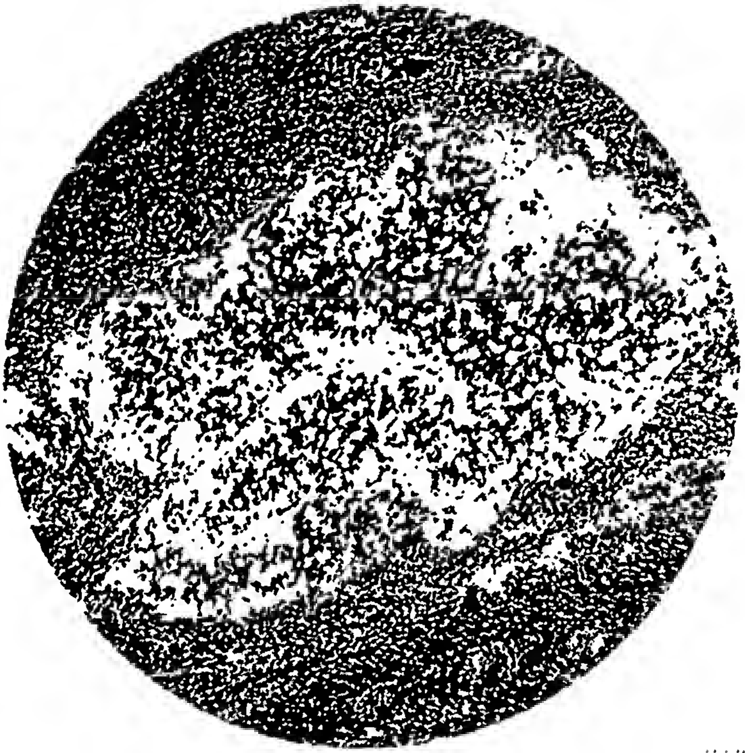

Fig. 9.—Showing reaction of the cellular heaps to fat stain, with marked lipoid contents of cells.

One must be considerably perplexed by the presence in abundance of these cellular heaps in the cortex, sometimes near the tunica albuginea about early follicle formations, or distributed generously about the larger atretic follicles. Their development must be admitted somewhat at the expense of the follicles, for the considerable proliferation of cells outside the follicle is at once the signal of a beginning degeneration within.

These interstitial formations show in their general topography slightly different aspects, according as one studies them in the cortex or in the medulla. In the cortex the cells are often gathered into compressed heaps of generally uniform configuration; usually they are in thin elongated rows arranged about the surface, varying in thickness. They may present a front of a few cells or of very many. In the medulla there is more of a tendency to the formation of solid cords. At times in the center of the cords a fusiform elongated cavity may be observed following the axis of the cord; sometimes it is reduced to a mere slit.

The early stages of follicle formation exhibit interesting changes. The granulosa cells are, as a rule, well developed; the follicle secretion is often present; the ova are often degenerate, and frequently bleeding will be seen to have occurred in the lumen. The thecal demarcation is always well preserved, and the peripheral cell formation is always extremely marked and decidedly active, as shown by deeply staining cells with a large amount of protoplasm, and large nuclei undergoing divisions. The vascular architecture even in these early stages is at once a conspicuous feature. At times blood cells would appear to be almost lying in contact with the cells; such a condition can only indicate an arrangement for the immediate transference of this secretion to the circulation. Few follicles of the subcortical region whose theca interna is transformed into interstitial gland tissue still possess the unaltered granulosa epithelium.

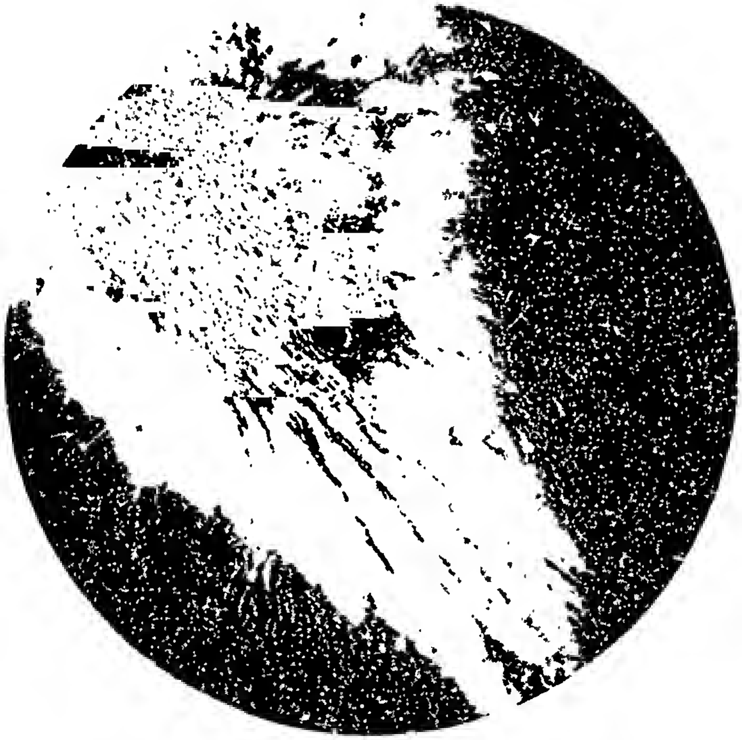

Fig. 10.—Showing fat reaction in a large follicle.

In numerous places it was possible to show a cluster of large cells about even the primordial ova, as though even here a hyperplastic process had been inaugurated. Furthermore one finds hyaline substances which are like corpora albicantia, of round or oval shape, in whose vicinity lie large yellow cells in the form of a loose wreath; their granules sometimes give a Sudan reaction but soon cease to alter under the influence of various reactions. Much more commonly there is found a species of atretic follicle whose cavity either shows a rounded form or has begun to collapse. The theca interna cells are plainly epithelioid and possess fine protoplasmic deposits which take a red color with Sudan.

Almost all continental observers, such as Orthmann, v. Velits, Heyse, Fehling, Rossier, and Lohlein are at pains to emphasize the presence, especially in the medulla, of many vessels of large size whose walls in many cases appear thickened and exhibit hyaline changes, but in no instance is any explanation offered for this almost telangiectatic condition. It would seem to us a possible explanation that one is here dealing with the vascular architecture brought into being by the very active perifollicular changes, and that inasmuch as this gland tissue is scattered everywhere throughout the organ it may become degenerated and disappear, leaving only this scaffolding of blood vessels behind.

When treated with Sudan or scharlach r these interstitial cells appear as large irregular-shaped cells with large nuclei and a wide protoplasmic margin, in which lie pigment and fat globules. The Sudan reaction is a conspicuous feature, the cells forming a wreath or mantle about the fibrous bodies. These bodies are shown by the fat reaction to be very numerous in all the sections of the ovary, and while this is a condition not by any means confined to osteomalacic ovaries, it is not often seen developed to such a great extent about atretic follicles and in the cortex generally.

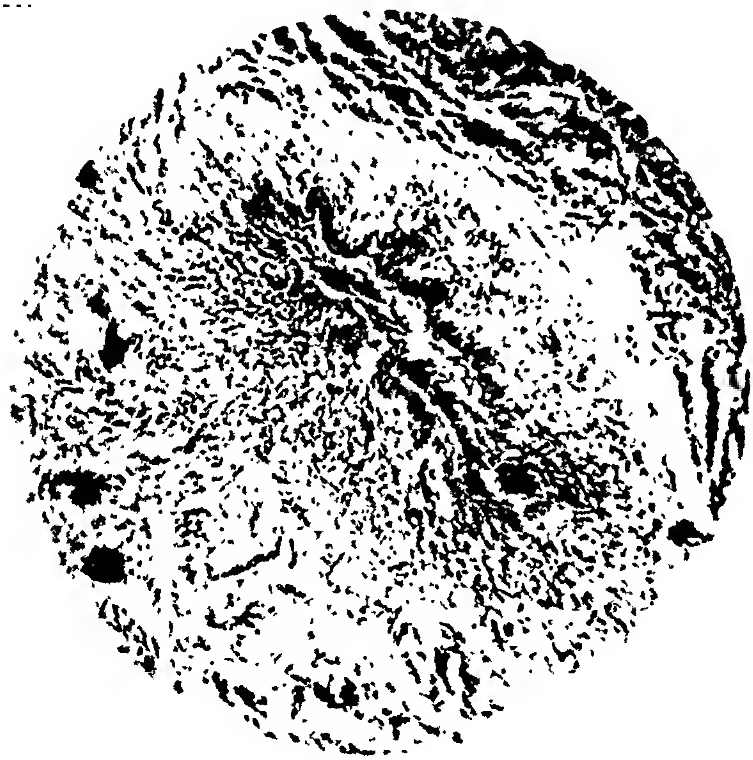

Fig. 11.—Perifollicular gland hyperplasia in a young girl suffering from metrorrhagia at puberty. Note the replacement of the follicle by this epithelial body formation.

If by contrast, one examines the ovary of a young woman who has suffered from irregular menses, bleeding constantly for a period of months, one is impressed with the presence of many forms of atretic follicles, about which are gathered varying amounts of hyperplastic thecal epithelium, at times forming blocks of cells of very active appearance. In almost every instance intrafollicular activity has been arrested, the granulosa is thinned with a thin connective tissue underlying it, and greater activity is visible in the perifollicular region, which, as above indicated, is a mass of large deeply staining cells possessed of a well-organized structure, a well-defined circulatory apparatus, and cells with conspicuous nuclear markings.

Every gradation may be seen between the large beginning atretic follicle with comparatively slight interstitial gland formation, to the small slitlike structure with very heavy perifollicular activity. In addition one is struck by the amount of special stroma tissue, and by the suggestion of the passage of these atretic structures into special stroma structures, almost formless masses. True graafian follicle activity is not in evidence, as was the case in the osteomalacic ovary; the vascularity is not so pronounced, and the muscle tissue is decidedly less. Stained with Sudan, the lipoid bodies show as finely distributed droplets. There are no signs of the collections free in the cortex of these epithelioid cells, as in osteomalacia.

Recently the opportunity presented itself of studying the ovary of a young girl at puberty in whom there had been irregular bleeding together with other disturbances occasionally encountered in puberty. She was of a fairly large, well-developed type, with heavy bones and large stature generally, although not obese, a pituitary type and undoubtedly the victim of pluriglandular disturbance. There were great evidences of ovarian activity, congestion, follicular hyperplasia, all gradations of follicle ripening, together with very marked evidence of interstitial gland formation, somewhat resembling the osteomalacic ovary, but differing from it by the absence of such widespread cortical hyperplasia, and by the persistency of granulosa cells; the type of cell is decidedly smaller and shows very scanty fat formation.

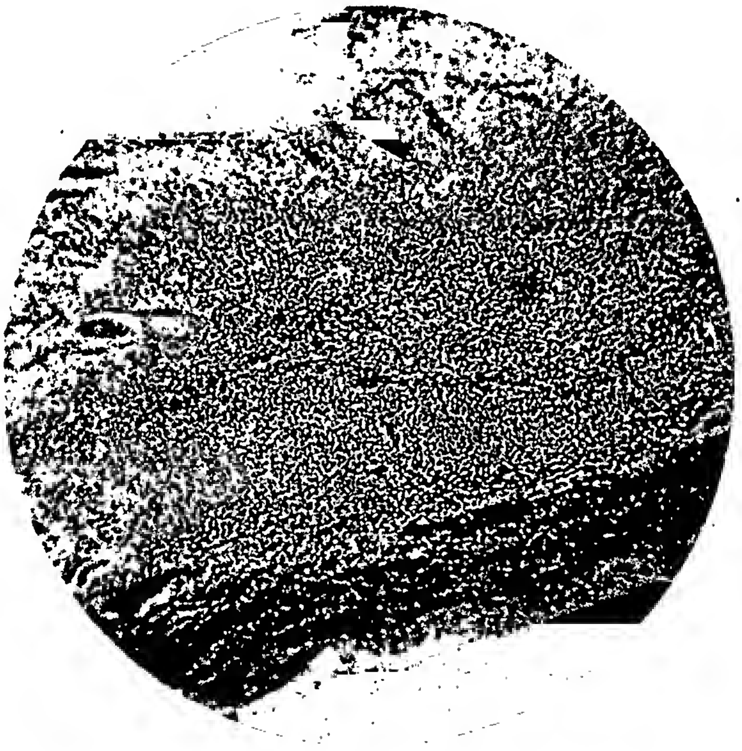

Fig. 12.—Widespread interstitial gland formation in the cortex of an ovary of a young girl at puberty.

Zondek and Aschheim have recently shown the remarkable influence of the pituitary on the follicular apparatus of the ovary. The experimental production of interstitial gland formation at the expense of the maturing follicle by the excessive stimulation by pituitary is of value in interpreting these osteomalacic changes in the human ovary.

One's ideas cannot but be influenced by the fact that after disturbing the ovarian function by castration, the symptoms of osteomalacia often decrease or disappear, so that, for example, a bony structure which has shrunk together, may be partially restored and made to function. It has certainly not been proved whether this is a case of a completely pathologic abnormal function, or merely that of the normal activity during pregnancy being increased by the disease. The ovarian function of internal secretion is probably connected like the folliele epithelium, with those elements which, by their whole character, show their origin to be in the gland cells. To these belong also the corpus luteum and interstitial ovarian glands.

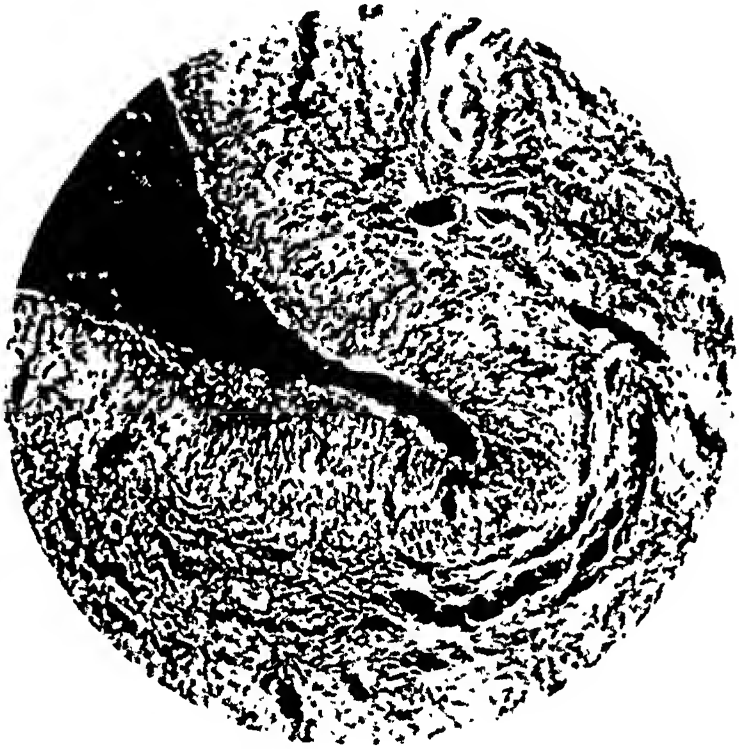

Fig. 13.—Interstitial gland formation in ovary of a young woman suffering from metrorrhagia. The thecal hyperplasia assumes an appearance similar to that in osteomalacia.

Hanau has studied the alterations in bones during pregnancy, which are corrected immediately after birth, and he believes with Birsch-Hirschfeld that the bony alterations in osteomalacia represent an exaggeration of the normal process. Does not this ovarian activity and interstitial gland formation likewise represent only a further stage of what occurs normally during pregnancy, for we are reminded by many authors that interstitial gland tissue is present in normal pregnancy. One can hardly be mistaken in considering that these changes in pregnancy and also in osteomalacia are primarily influenced by the functions of the sex glands.

CONCLUSIONS

In this preliminary report no attempt has been made to fasten or attribute to the ovary, disturbances which would completely account for the changes in osteomalacia, for countless observations on the several ductless glands show them to be definitely affected. Thus, the pituitary, thymus, adrenal, and parathyroid disturbances may well be symptoms of a complex pluriglandular disturbance, but one does feel confident that this somewhat decided ovarian hyperplasia plays a prominent part in this process, as shown by the following:

The prompt cessation and permanent cure of many cases after castration.

The occurrence and aggravation during pregnancy, or even during menstruation, of the osteomalacic state.

The failure of other endocrine therapy.

The high degree of fertility in osteomalacia.

The occurrence in the ovary of structures which must be associated with specific ovarian functions.

The intense vascular changes in the ovary, congestion with almost the development of a telangiectatic condition.

The presence of almost mature graafian follicles during pregnancy, with a well-marked corpus luteum.

The occurrence of interstitial gland formation in pregnancy and at puberty, and such other times, when one expects ovarian hyperfunction, together with the fact that certain bone changes slightly resembling osteomalacia occur normally in pregnancy. All these facts seem to indicate that in the condition known as osteomalacia, one probably has to deal with a process closely related to ovarian hyperactivity, and that this excessive ovarian function becomes in some way diverted along pathologic lines.

REFERENCES

Archangeli: Quoted by Scipiades, Ztschr. f. Geburtsh. u. Gynäk., lxxi, 159. *Blair Bell:* Sex Complex, New York, 1920, Wm. Wood and Co. *Birsch-Hirschfeld:* Lehrbuch. *Bossi, L. M.:* Zentralbl. f. Gynäk., 1907, xxxi, 69. *Bouin, M.:* Histogenese de la Glande genitale femelle chez Rana temporaria, These de la Fac. des Sc. de Nancy, 1900; Arch. de Biol., 1900, xvii. *Erdheim, J.:* Sitz. d. R. Akad. d. Wissensch. Math.-naturw. C., Wien, 1907, cxvi, Part 3, 311. *Fehling:* Ueber Kastration bei Osteomalacia, Verhandl. d. deutsch. Gesellsch. f. Gynäk., 1888, ii, Kongress Halle. *Fehling:* Arch. f. Gynäk., lxxxix, 191. *Fränkel, O.:* Lectures on Pathology, Wien, 1921. *Hanau, F.:* Ueber Osteomalacia, C. f. Schw., 1892. *Heyse, G.:* Ein Beitrag zur Mikroscopischen Anatomie der Ovarien Osteomalacischen, Arch. f. Gynäk., 1897, xxxiv, 321. *His:* Beobachtungen ueber den Bau des Saügethiereierstockes, Arch. f. mikr. Anat., 1865, i. *Hofmeister:* Quoted by Scipiades, Ztschr. f. Geburtsh. u. Gynäk., lxxxi. *Klose:* Thymus Drüse und Rachitis, Zentralbl. f. allg. Path. u. path. Anat., 1914, xxv, No. 1. *Koelliker:* Ueber Corpora Lutea Atretica bei Saügethieren, Verhandl.

d. anat. Gesellsch., Kiel, 1898. *Krönig:* Quoted by Scipiades, Ztschr. f. Geburtsh. u. Gynäk., lxxxi. *Levi:* Quoted by Scipiades, Ztschr. f. Geburtsh. u. Gynäk., lxxxi. *Limon, M.:* Etude Histol. et Histog. de la Glande Interst. Ovar., Arch. d'Anatomie Microscopique, 1902-1903. *Lohlein:* Ztschr. f. Geburtsh. u. Gynäk., xxix, 18. *Moussu and Charrin:* Osteomalacie experimentale, Compt. rend. Soc. de Biol., 1901. *Orthmann:* Jubileumssitzung d. Gesellsch. f. Geburtsh. u. Gynäk. zu Berlin, 1891. *Pankow:* Quoted by Scipiades, Ztschr. f. Geburtsh. u. Gynäk., lxxxi. *Pause:* Quoted by Scipiades, Ztschr., f. Geburtsh. u. Gynäk., lxxxi, *Plato, J.:* Zur Anatomie und Physiologie der Geschlechtsorgane, Arch. f. mikr. Anat., 1897, l. *Rossier:* Arch. f. Gynäk., xlviii, No. 3. *Sellheim:* Quoted by Scipiades, Ztschr. f. Geburtsh. u. Gynäk., lxxxi. *Tandler, J., and Gross, S.:* Wien. klin. Wchnschr., 1907, xx, 1596. *Tourneux:* Des Cellules Interstit. de l'Ovaire, Jour. de l'anat. et de la physiol., 1879, xv. *v. Velits:* Ueber die Heilung der Osteomalacie, Ztschr. f. Geburtsh. u. Gynäk., 1892, xxiii, 630. *Wallart, J.:* Ztschr. f. Geburtsh. u. Gynäk., 1908, lxi, 581. *Wild:* Das Puerperale Osteophyt., I. D. Lausanne, 1901. *Zunz, L.:* Ueber den Einfluss der Kastration auf den Respiratorischen Stoffwechsel, Deutsch. Ztschr. f. Chir., xcv. *Zondek, B., and Aschheim, S.:* Klin. Wchnschr., 1927, 248.

(For discussion see page 837.)

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THE FORMATION OF AN ARTIFICIAL VAGINA BY A NEW PLASTIC TECHNIC

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THE two best accepted technics for the formation of a vagina in malformed individuals, are the one, the method of Baldwin[1] which utilizes a double barrel segment of the small intestine transplanted into the rectovesical septum (53 cases with a mortality of 20.75 per cent), and the other the operation of Popow-Schubert[2] in which the lower rectum is transplanted into the vulva, the upper rectal segment being utilized for reestablishing the continuity of the intestinal canal (53 cases; no immediate operative deaths; 2 died of sepsis; frequent intestinal fistulae and varying degrees of incontinence. Franz[3]).

Other less dangerous methods, such as the homoplastic transplantation of vaginal mucosa obtained from other patients (Küstner, Mackenrodt), Thiersch skin grafts, Douglas peritoneum transplants (Stoeckel-Kroemer), utilization of the labial mucous membrane (Bumm, Graves), have given almost uniformly unsatisfactory results, because of subsequent scarring and contraction with consequent obliteration or stenosis of the newly formed canal. The same applies to the use of a pedunculated skin flap with immediate flap transplantation (Fraenkel[4]).

Because of the fact that an artificial vagina is made solely for the purpose of establishing a coital organ, it seems unjustified, in our opinion, to undertake an operation which involves grave risks. We have frequently refused to operate at all in unmarried individuals with no strong sex urge. Occasionally, however, individuals present themselves, either married or with strong sex feeling, in whom it seems justified, for the sake of the happiness of the patient and that of the husband, to attempt to establish a vagina, in spite of the danger incident to either the Baldwin or Schubert operation. In the last case which presented itself, a woman divorced because of impotentia coeundi, we tried a new technic which appears entirely devoid of danger and which has now, after a period of over six months, given a satisfactory and apparently a permanent result.

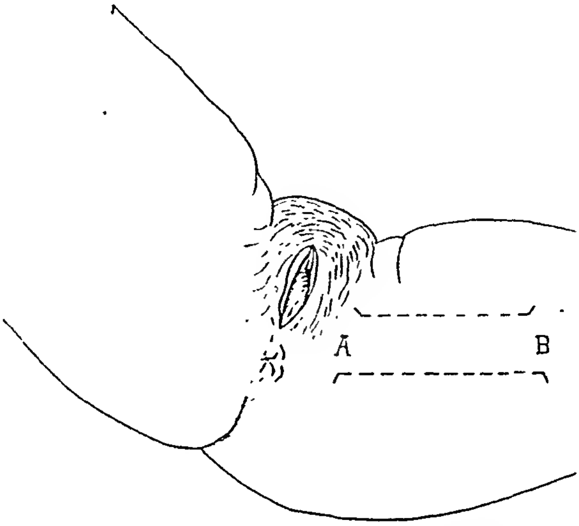

Fig. 1.—Patient in lithotomy position, absence of vagina. Outline of skin flap between *A* and *B*, the dotted lines representing the incision. This flap was undermined completely but remained attached at *A* and *B*.

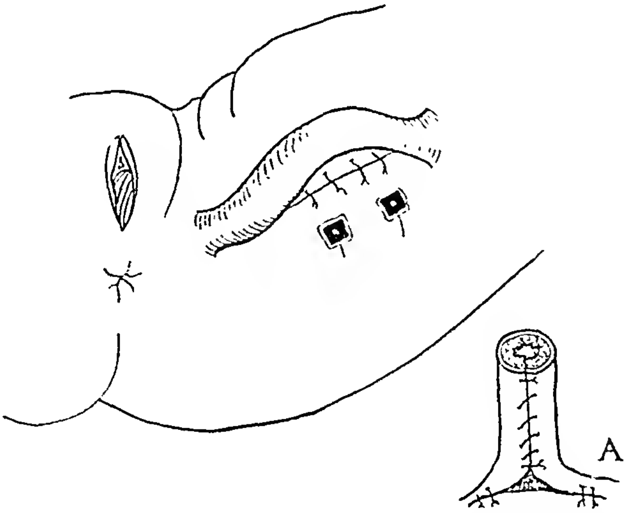

Fig. 2.—Tubular flap after union of skin edges. Beneath the tube the skin gap on the thigh has been approximated by two shot and plate tension sutures and interrupted skin sutures. *A* shows a schematic cross-section of the tube seen from beneath with an empty inside core to allow for edema. The method of approximating at the base is shown. It appears wise to leave a small triangular area uncovered for drainge.

Our aim was to devise (1) a well vitalized skin flap, devoid of hair; (2) a flap readily and freely movable for transplantation; (3) a flap with a raw surface free of infection. We have obtained such a flap by modifying the tube-flap method described by Gillies and others.[5]

TECHNIC

The flap is outlined along the inner surface of one thigh by making two parallel incisions extending from the hairline close to the labia, downward along the long diameter of the thigh for about seven inches. Between these two incisions which are placed three inches apart, the skin and underlying fat are undermined down to the fascia lata for the entire length of the incisions. (Fig. 1.) If, as we found, there is too thick a layer of fat, some of the subcutaneous tissue may be carefully trimmed off from the deep surface of the flap. The long narrow flap, attached merely above and below, is now sutured together with the raw surface turned toward the inside of the tube, by a continuous or interrupted fine silk suture which takes in merely the skin, completely inverting the subcutaneous tissue. (Fig. 2.) At the upper and lower ends where the skin attachment is maintained, small nicks of about ½ inch, directed diagonally outward from the flap, will allow better approximation of the lower portion of the tube. (Figs. 1 and 2.)

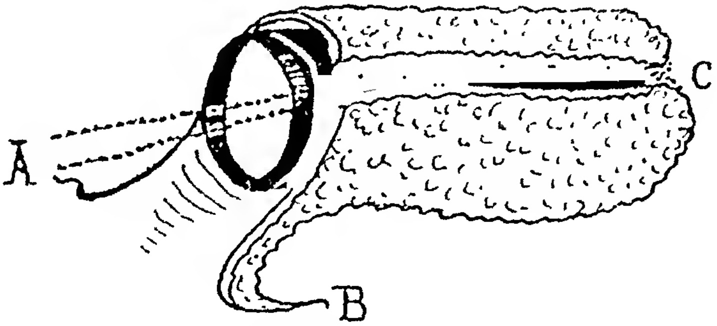

Fig. 3.—Skin flap detached at distal end, split open, and wound around hard rubber vaginal speculum. At *C* the two guide sutures have been passed, pulled through the speculum and appear at *A*, thus inverting the top of the new vagina. The line *A* to *B* represents the base of the flap.

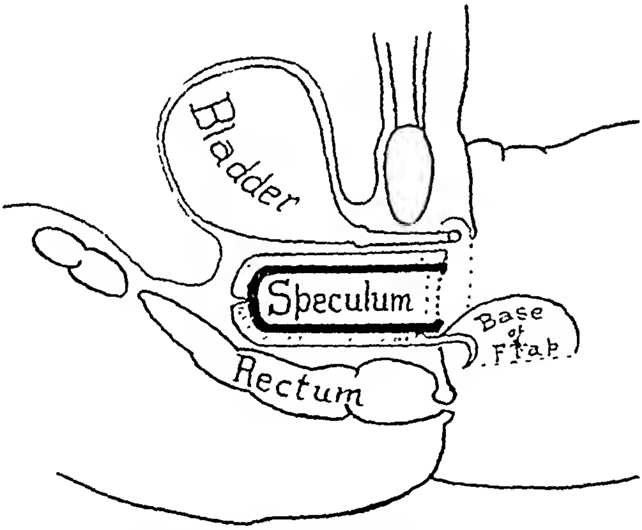

Fig. 4.—Schematic section of pelvis showing the speculum covered with the flap introduced into the new formed gap between bladder and rectum.

The denuded area on the thigh, left open beneath the bridge-tube flap, is closed by undermining the skin laterally (keeping close to the fascia lata) until the two skin edges can be brought together without undue tension beneath the newly established skin tube. If tension is encountered, 2 or 3 shotted, plate sutures may be adjusted before the skin edge is approximated with a running or interrupted catgut suture (Fig. 2). A very light dressing which exerts little pressure on the tube-flap is applied.

If the tube has not been made so long as to impair its nutrition, the distal end of the flap may be partly incised two weeks from the primary operation, in order to force the proximal pedicle to assume more and more of the nutrition of the entire flap, but care must be taken not to completely disconnect the distal attachment, until the final step of the operation is to be accomplished, as otherwise retraction and shortening may take place.

The third and final step consists in establishing (1) a canal in the rectourethral vesicle septum by incising in the vulvar orifice and separating bluntly the loose connective tissue between the urethra and bladder anteriorly and the rectum posteriorly, for a distance of at least 3½ inches, preferably until the peritoneal fold has been encountered and pushed up; (2) (a) the complete cutting across of the distal end of the flap; (b) the splitting of the flap along the original line of skin union; (c) the careful excision of such subcutaneous scar tissue as has formed in the interior of the flap. The flap when unrolled, forms a large, supple, uninfected skin flap which is further mobilized by extending the incisions at the base of the pedicle prolonging the two incisions first used, almost up to the vulva; (d) turning the pedicle through an arc of 180 degrees and then folding it over an appropriate hollow vaginal plug or speculum with its raw surface outward, the epithelial surface in contact with the speculum. (Fig. 3.) Near the top of the speculum two holes have been bored. Near the free end of the flap two strong silk guide sutures are passed (Fig. 3-*C*), and pulled through the speculum so as to appear at its open end (Fig. 3-*A*). This maneuver turns in the top of the flap so

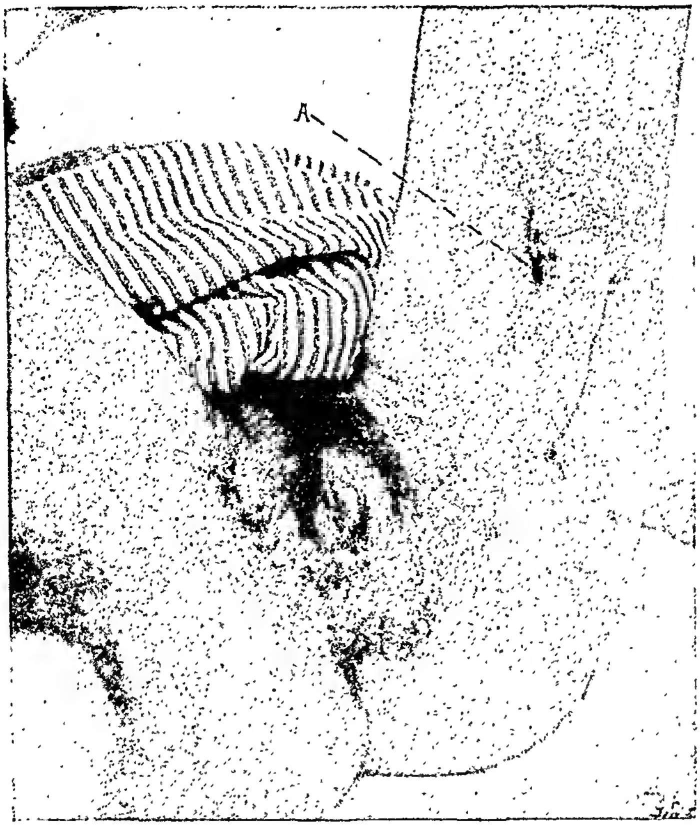

Fig. 5.—Appearance of skin tube two weeks after first step of the operation. *A* points to area of necrosis due to an error in fashioning the flap.

as to form the upper blind end of the vagina and at the same time supplies a drainage opening for discharges. If necessary, the longitudinal edge of the flap can be secured to the speculum by a few transverse sutures. (e) Introduce the speculum and flap into the gap between the rectum and vagina (Fig. 4), (f) uniting the free end of the anterior portion of the flap wherever possible with the vulvar skin.

In eight days the speculum may be removed. Either then or four days later the base of the flap as it enters the new formed vaginal opening, is completely severed and the edge of the new vaginal tissue united to the vulvar edge. The redundant base of the flap is turned back on to the thigh and is used to cover the granulating area left on the thigh close to the vulva.

The resulting vagina should be dilated with plugs by the patient for a period of time varying from two months to a year until the danger of possible contraction is passed.

The first case which we operated according to this technic is as follows:

The patient was a feminine looking person, twenty-six years old, married but divorced, who had never menstruated. She gave the history of attacks of pain in both upper flanks occurring almost every month although not very regularly. Sex desire was strong.

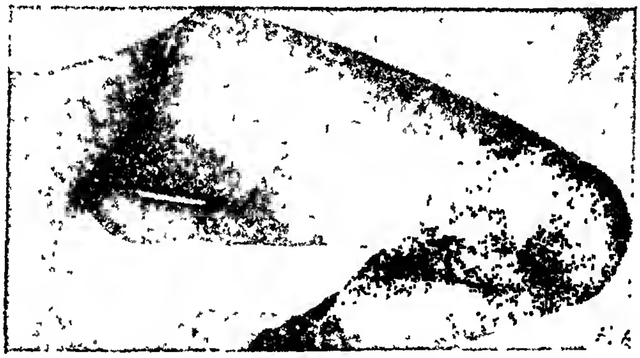

Fig. 6.—Another view of the tubular flap showing its relation to the vagina and the hair line.

General physical examination was negative except for a slight thyroid enlargement, hirsuties on upper lip and abdomen.

Pelvic examination showed a normal vulva with urethra moderately dilated; a blind inelastic vaginal sac, 1.5 cm. long, resulting from the failure of a previous attempt at forming a vagina. Rectal examination revealed no uterus. With a bladder sound in place, the rectovaginal septum was found to be extremely thin. The feminineness of this person was established by demonstrating the female sex hormone in her circulating blood. (Frank, R. T. and Goldberger, M. A.)[6]

On March 18, 1926 the first stage operation for construction of a vaginal flap was performed.

A full-thickness skin flap about 3 inches wide and 8 inches long was freed from underlying fascia lata of the upper inner side of the left thigh, extending longitudinally down the thigh, and remaining attached at each extremity. The edges of the flap were approximated by a series of catgut sutures turning the subcutaneous fat inward and leaving a cylinder covered by skin. (See Figs. 1 to 4.)

Too thick a layer of subcutaneous tissue was allowed to adhere to the skin. In consequence of this the skin tube was tense. Next day edema had increased this tension. To this we attribute the superficial necrosis which developed in one part of the flap (Fig. 5-*A*).

Following the above operation the patient's temperature rose to 103°, subsequent examination showing that she was suffering from pyelitis. She was cystoscoped, the ureters catheterized, with immediate improvement of her condition.

The wound healed well with only slight sloughing, leaving a flap which was covered with skin, continuous with the thigh above and below. (Figs. 5 and 6.)

May 29, 1926, partial incision of the tubular flap: The flap was incised at distal end, halfway through its diameter, the cut edges united with silkworn gut sutures. The above procedure was only partially successful as the line of incision showed a tendency to reunite.

June 22, 1926. Operation, utilization of tubular flap for construction of artificial vagina: The flap was completely separated at its distal end, split longitudinally and thinned by removing some fat from its internal surface. The rudimentary vagina was split transverely in the midline and the cellular tissue separated by blunt dissection for a distance of about 3½ inches. Incisions carried laterally on each side, widened the vulvar orifice.

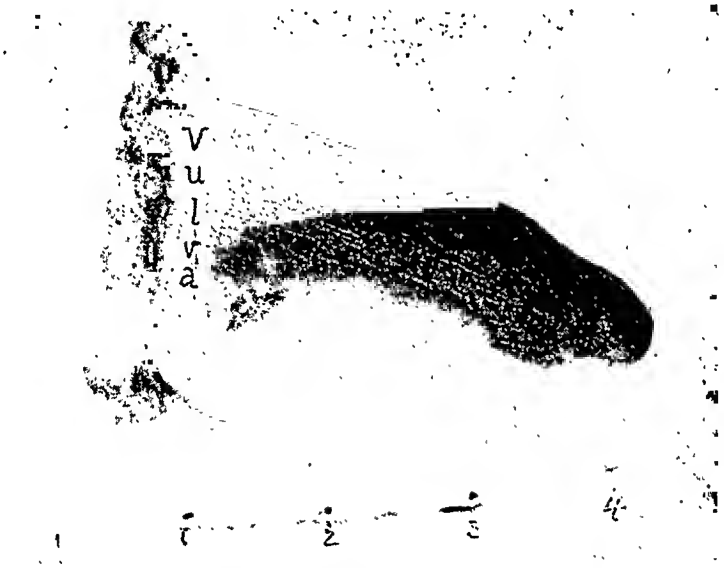

Fig. 7.—Positive made from impression taken of new vaginal canal showing its liberal dimensions and correct shape.

The flap prepared as described above, with the subcutaneous surface on the outside and skin in contact with the speculum, was wound around a tubular speculum and this instrument inserted into the newly made canal so that the raw surface of the flap came in contact with the pelvic cellular tissues.

Following this operation there was some superficial sloughing of tissues in the vagina but the entire flap "took." June 30, 1926, silkworn gut sutures were removed and the speculum was taken out of the vagina. Recovery was uneventful.

This patient has now been under observation for seven months. The new formed vagina is now approximately 4 inches in length and readily admits two fingers. The perineal body is good. Fig. 7 is a photograph of a plaster cast showing the dimensions of the vagina.

This new method is recommended for further trial. It is devoid of danger and permits the using of healthy, well-nourished, fully mobilized skin flaps, devoid of hair.

In the next case which presents itself for operation, we may take a smaller flap from the inner side of each thigh, utilizing one for the anterior and lateral, the other for the posterior surface of the canal, in order to obviate any possibility of necrosis due to undue length of the single flap, and to give ample material for covering.

REFERENCES

(1) *Baldwin:* Ann. Surg., Sept., 1904, p. 17. (2) *Popow:* Zentralbl. f. Gynäk., 1918, p. 639 (Ante-dated, Schubert); *Schubert:* Zentralbl. f. Gynäk., 1923, No. 9, p. 347. (3) *Franz, R.:* Zentralbl. f. Gynäk., 1926, No. 9, p. 545. (4) *Fraenkel:* Zentralbl. f. Gynäk., 1924, xlviii, p. 193. (5) *Gillies:* Plastic Surgery of the Face, 1920, London. (6) *Frank, R. T., and Goldberger, M. A.:* Jour. Am. Med. Assn., 1927.

(*For discussion, see page* 835.)

THE "SAFE PERIOD" AS A BIRTH CONTROL MEASURE[*]

A STUDY AND EVALUATION OF AVAILABLE DATA

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A REPORT FROM THE COMMITTEE ON MATERNAL HEALTH

AN INQUIRY concerning that part of the menstrual cycle supposed to be free from risk of pregnancy must take up both the search for general rules and for some test or tests that may be applied to the individual woman. At present the second would seem to be the more promising trail to follow. The problem as a whole has three main aspects, statistical, therapeutic, and theological.

An integral part of this research is the attempt to define the day or days of maximum fertility, in order, for example, to furnish exact advice in cases of relative infertility or to so place conception as to avoid the feeding problems of unfavorable birth seasons like July and August or times of travel.

Is there a "safe period"? Yes, for certain women. If we deny this, we must discredit, on our case records, the entries from statements made by a small number of intelligent, seemingly credible patients, who affirm that they have been able to avoid pregnancy through omitting precautions during a given group of interval days and have conceived at will during some other part of the interval. The records are too few, however, and the evidence of the absence of other possible causes of infertility during the sterile days too inexact to label this testimony unimpeachable. To carry full weight each patient should have had a number of children and offer records made throughout their histories rather than mere memory. The assembling of a series of histories of patients with "safe periods" has not been done, as far as we know, nor has this record been coupled with vaginal smears for the sterile and fertile periods to place ovulation, or with tube insufflations, or inspection for temporary cervix catarrh, or other tests that might bear witness to various factors involved.

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[*] Read in summary at a meeting of the New York Obstetrical Society, March 8, 1927.

We approach the question of infertile days among women with whom the dates of the last period are known from a half dozen different angles. (1) Records of pregnancies resulting from isolated intercourse. (2) Ovulation as studied at laparotomies or on removed ovaries. (3) Effect, on the subsequent period, of a castrating irradiation given at different days of the interval. (4) Studies of the age of very young embryos. (5) Types of tubal contraction and alterations in epithelial layers as found in women and shown to occur, in animals, at egg-passing time. (6) Hormones in the blood at different times. (7) Vaginal smears.

In a matter where we must repeatedly compare parts of the menstrual cycle, the graphic charts (Figs. 1, 2, 3) which I have brought together from various sources may well constitute the chief item of the presentation. The Ott (*A* in Fig. 1) and Schroeder (*G, H* in Fig. 3) charts are direct copies. The others are recast from the data on a scale and in a sequence favorable for deduction. The evidence is given with a fulness that may seem confusing, but it is only thus that one may separate and evaluate the items and the witnesses. On the matter of ovulation shown at laparotomy I have ventured to weigh the evidence a little in this way. Series which have not shown sections of corpora lutea for estimate of age cover a less area. The older and partially supplanted observations, such as the laparotomies of Leopold and his followers, or of Mall on young embryos, have been omitted. No theory has been allowed to affect the entries of evidence.

One cannot, as is readily seen, work these conflicting indications into a snug schedule fitting a clear cut rule, but one may thus, for the first time, observe some massing of evidence, such as the rather spectacular piling up of ovulation-operation data toward the nineteenth day and the nearly complete absence of cases afterward. This, it will be observed, fits the low point of conception below. The chart has had to be cast as if the twenty-eight day type of cycle was standard. The variations are shown on section *D* (in Fig. 2) but we may not forget that this four week standard is only a convention and convenience as it fits something less than three-fourths of women in temperate climates.

The Wave of Well Being.—Turning to the first section of the chart *A* (in Fig. 1) one may quote De Lee. "If one studies the life of woman carefully, clinically, and with the help of physical methods, one can determine an ebb and flow in her activities, mental and physical. This cyclic movement, or periodicity, reaches the highest point of its tide just before the appearance of the menses. The functions of the body, reflex excitability, pulse blood pressure, pulmonary activity, heat radiation, temperature, excretion of urea, and muscular power all indicate increase according to the line in the figure, up to within a day of the menses; on this day there is an abrupt regression, then a gradual recovery, which rebounds and drops to normal about the seventh day after menstruation (Reinl). This periodicity is slightly manifest in the male, and recurs in five to six week intervals. Perhaps it is the external evidence of the formation of spermatozoids." It is

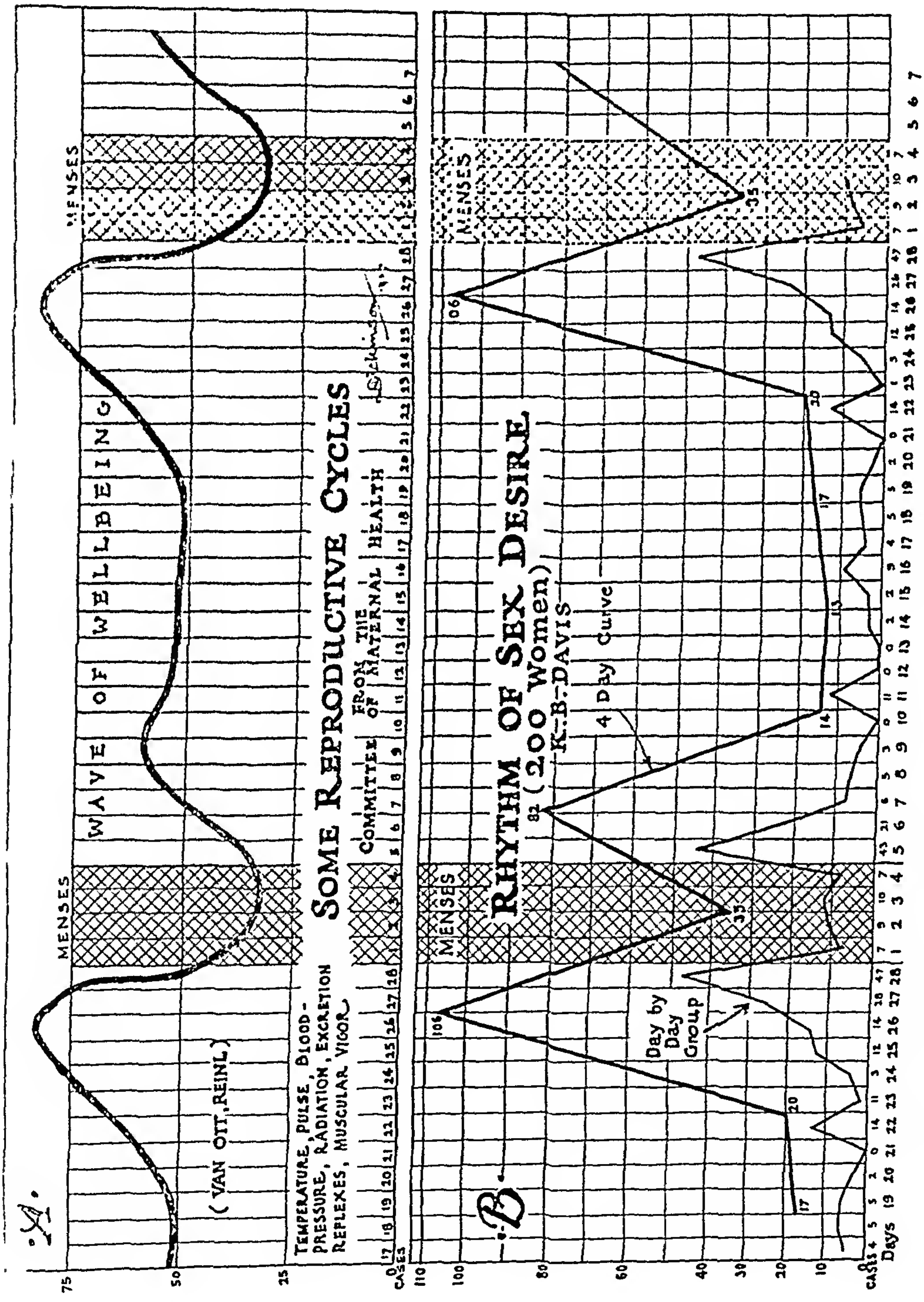

Fig. 1.—The Menstrual Cycle. *A*, The wave of well-being. *B*, The rhythm of sex desire.

said that the simplest evidence to obtain is the temperature curve, and that it is a fair indication of the periodicity which the other tests may be expected to yield.

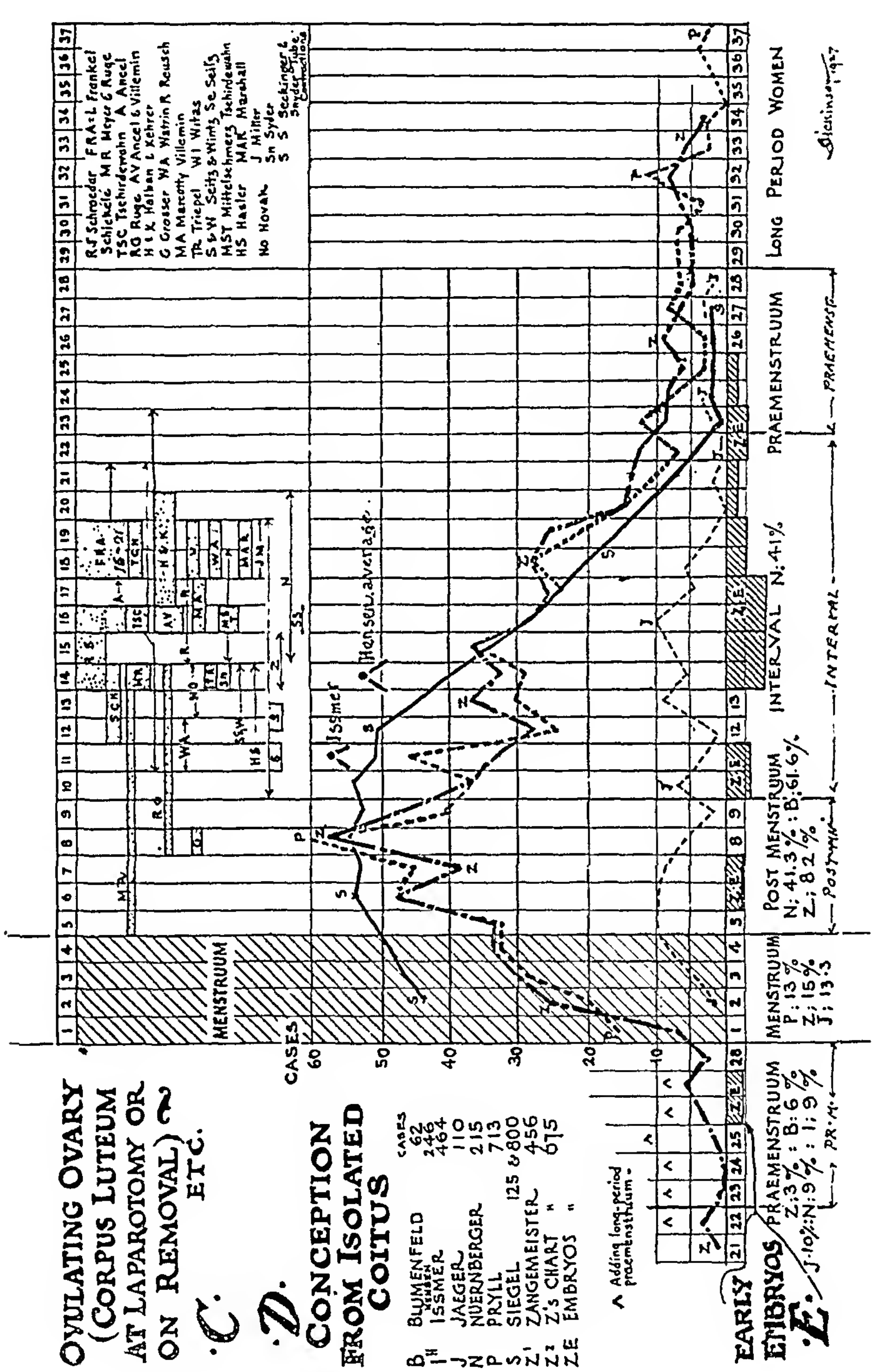

Fig. 2.—The Menstrual Cycle. *C*, The ovulating ovum. *D*, Conception from isolated coitus. *E*, Early embryos.

The Sex Desire Cycle.—The second curve in our chart *B* (in Fig. 1) is adapted from a paper by Dr. Katharine B. Davis. In order to fit our scheme, the points in the Davis graph which are on a dividing line between days have been allotted to the day before and the day after, in rotation, so as to distribute them as fairly as possible. Because of the occurrence of such reports as "a week before," which pile up on given days unduly, the four-day form of graph was selected as likely to show a clearer grouping. It will be noted that the larger, and also the secondary wave of desire, show a general correspondence

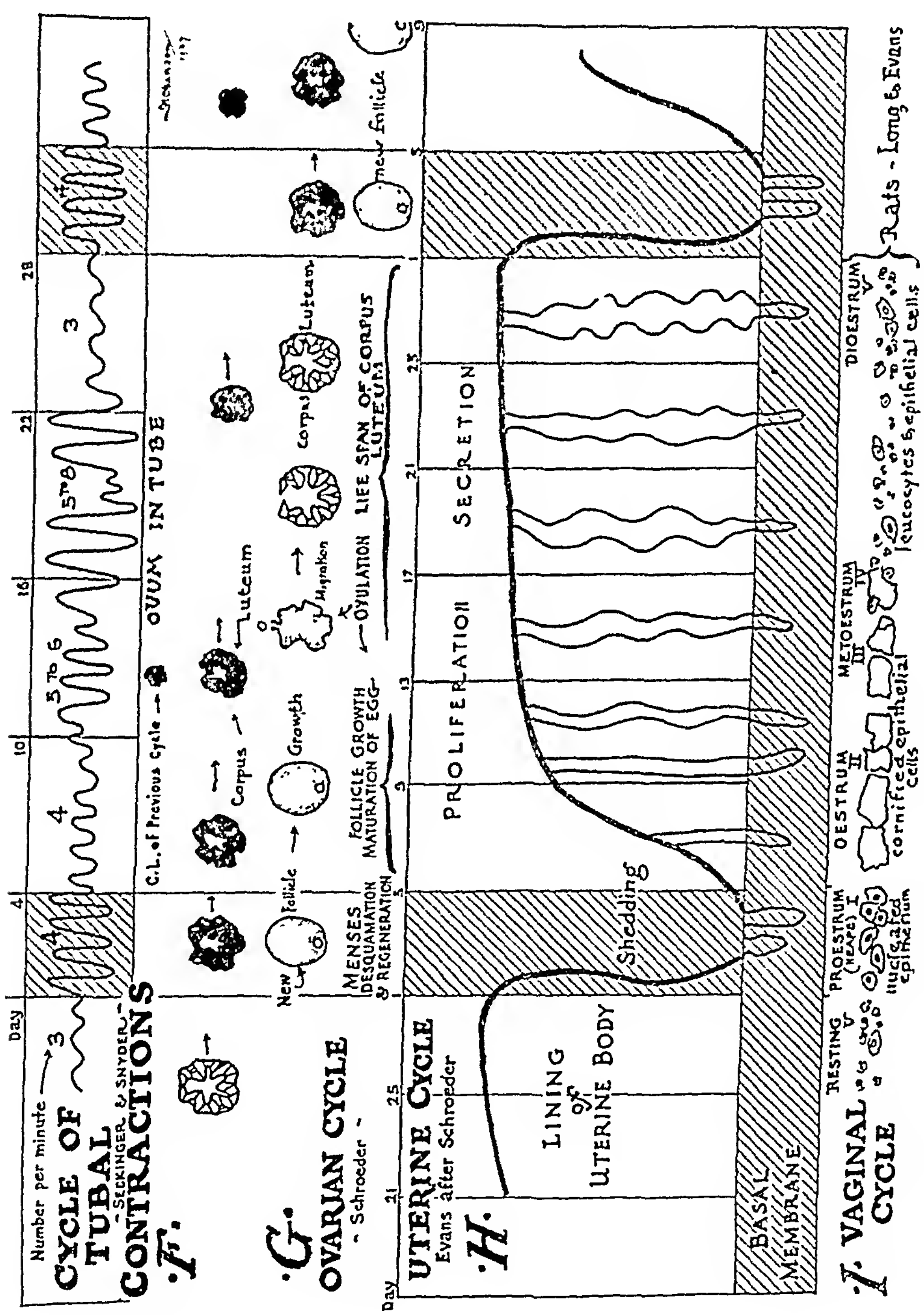
CYCLE OF TUBAL CONTRACTIONS
- SECKINGER & SNYDER -
·F·
Number per minute
Day
4
10
18
22
28
3
4
5 TO 6
5 TO 8
3
OVUM IN TUBE
C.L. of Previous Cycle
New Follicle
Corpus Luteum
Growth
Migration
Corpus Luteum
new follicle
·G·
OVARIAN CYCLE
- Schroeder -
MENSES DESQUAMATION & REGENERATION
FOLLICLE GROWTH MATURATION OF EGG
OVULATION
LIFE SPAN OF CORPUS LUTEUM
UTERINE CYCLE
Evans after Schroeder
·H·
Day
21
25
1
5
9
13
17
21
25
LINING of UTERINE BODY
Shedding
PROLIFERATION
SECRETION
BASAL MEMBRANE
·I· VAGINAL CYCLE
RESTING
PROESTRUM (HEAT) I
nucleated epithelium
OESTRUM II
cornified epithelial cells
METOESTRUM III
DIOESTRUM
leucocytes & epithelial cells
Rats - Long & Evans

Fig. 3.—The Menstrual Cycle. *F*, Tubal contractions. *G*, Ovarian cycle. *H*, Uterine cycle. *I*, Vaginal cycle in rats.

with that of well being or physical activities in section *A* (Fig. 1) and that both of them bear a certain relation to the curve of the development in the lining of the uterus, *section G* (Fig. 3). It has long been generally accepted as a fact that the time of strongest sex urge in women, and the sole period of responsiveness in very many women, coincided with the most favorable time for the occurrence of conception, the postmenstrual week. If, however, women in general fit into the plan of these two hundred, this statement must be modified. The group of greatest frequency of desire falls into the period of least likelihood of conception. It is the second high point that does come close to the postmenstrual time when, according to chart *D* (Fig. 2), coitus is most likely to result in pregnancy.

The Ovulation Cycle.—The time of rupture of the follicle in its relation to menstruation has been studied in many hundred abdominal operations by a number of gynecologists, such as Schroeder, Ruge, Halban and Fraenkel. Taking the visual evidence of recent escape of the ovum from the ovary, or judging by microscopic sections of the removed corpus luteum, or of the yellow body in ovaries removed at operation, one finds that, whatever its scattering character before that time, testimony tends to accumulate toward the fourteenth to nineteenth days very strikingly, and then suddenly goes blank. The benefit of graphs lies in this appeal of grouped evidence to the eye. The other witnesses are placed on the same chart. Mittelschmerz, with one swollen, tender ovary, (MST), on the eleventh day; Snyder's tube contractions; epithelial changes that correspond in appearance with the linings of tubes in animals as the ovum is found to be passing; Seckinger and Snyder's waves of high contractions in the tube that fit the same type in the animal with the egg going by; and the striking fact that a castration dose irradiating the ovary finds a line of demarcation between the arrest or the nonarrest of the subsequent menstruation (Seitz and Wintz) on the fourteenth day—all these "marshall" themselves in the region on which that doyen of the physiology of reproduction would agree.

The earlier observations based on mere inspection of corpora lutea at operation are said by Ruge and Triepel to be of scant value. "Fresh" or "old" in this connection means nothing, unless the yellow body be cut out and studied microscopically. The error can be from one or two days to two or three weeks. Marcotty in studying corpora lutea even discounts Fraenkel and acclaims Meyer and Ruge and Schroeder as exact because they investigated the uterine mucous membrane in their cases as well as the follicle-corpus-luteum findings, and checked up the two processes against each other. Yet Fraenkel and his associates, Hergesell, Dittler, Tschirdewahn and Derck, have looked into ovarian conditions in 379 laparotomies as shown in Fraenkel's clear summary in the Halban-Seitz *Biologie-Pathologie.* "Inspection of the surface of the ovary alone," he says, "is insufficient to recognize a developing follicle or an old corpus luteum with certainty. It is decisive, however, for judgment on a follicle just ready to burst or recently opened." The cherry-sized, prominent, red, easily bleeding corpora he classes as one to three days old and these were seen from the eleventh to the twenty-sixth day, the two twenty-sixth day cases being women with thirty-one day periods. "In four week habits the eighteenth and nineteenth days were most constant." "An exact statement of a definite day as a rule for ovulation is false." While he admits his observations were microscopic only, he avers that many of Schroeder's dates are queered by his cases being pathologic. Schroeder's paper covering 100 operations carries great weight, and his chart is very generally copied, here shown slightly modified in sections *G* and *H* (Fig. 3). Meyer and Ruge, at 106 operations, found a high correlation between the endometrium and the corpus luteum, the recent corpus luteum running with the early premenstrual lining, the mature corpus with the later stages, and retrogression about the onset of the menses. Halban and Koehler, in 40 laparotomies, shelled out the yellow body simply (not with the cautery as in Fraenkel's 9 cases). Uterine bleeding of the type of the patients' regular periods came on two to four days later in 92.7 per cent of the cases, with a regular period four weeks later. If the extirpated corpus was dropped into the peritoneal cavity the prompt bleeding did not follow. Ancel and Villemin, on the basis of 27 cases with healthy ovaries, doubt that one can determine a follicle about to rupture, and declare one can only count on the hole of rupture as actually observed.

In castration by the x-ray, Seitz and Wintz declare that, if done before the fourteenth day, no further period appeared in 95 per cent of the cases, whereas if done after this day the next period occurred in 96 per cent. They therefore argue for a single large dose in the first half of the intermenstrual time.

Because spermatozoa are thought by many authors to have a life not over forty-eight hours, and eggs to be fertilizable only a few hours, and as the gap between fruitful intercourse and ovulation runs up to seven or ten days, as shown in sections *C* and *D* (Fig. 2), attention has been drawn to the possibility of rupture of the follicle by coitus. Coitus has this effect in the domestic rabbit and cat and on the ferret, the interval being about ten hours in the rabbit. Triepel differentiates between ordinary or spontaneous ovulation and artificial or coital, and argues ably for the latter. Grosser would make the group threefold: (1) spontaneous, (2) missed, and (3) artificial, or what I might call coital. In the rabbit orgasm seems necessary (Hammond and Asdell). Grosser places coital ovulation about the eighth day. His "missed" ovulation provides for those eggs that never ripen and burst, as in Corner's monkeys (1924). There is the further possibility, mentioned by Stockard, of more than one ovulation in the menstrual cycle. Evans suggests extra-cyclic ovulations.

In the matter of late ovulation we may not forget the fertility of the orthodox Jewess who must not have intercourse before the eleventh day from the beginning of the period, though there seems to be some uncertainty about the exact day.

One may modify the words of Hammond and Asdell and say: There is shown (in our charts) "an average probability in the mass, but it is not necessarily true of the individual." Giles shows that the length of the cycle may vary from twenty-one to thirty-five days; therefore the time of ovulation, if all the cases were grouped on the twenty-eighth day cycle, would vary from −7 to +7 from the normal, thereby causing a variation in degree of fertility at different times such as is shown by our chart at sections *C* and *D* (Fig. 2). We shall be obliged to go back to the original records, both of isolated conception and operation-ovulation, and group together, in each, the cases of three- and four- and five-week cycles, to get clearer notions.

Conception from Isolated Coitus.—Reports from more than 1000 women are recorded where pregnancies followed single exposures or brief visits of the husband. These have been reviewed and charted by Zangemeister, Pryll and Siegel. The three lists are largely made up from the same material and chiefly from Schlichting, Gossrau, Hecker, and Ahlfeld. Siegel's first paper dealt with some 320 women but his first graph took 125 as being above criticism, while his 800 included all the instances of single or limited coitus he could find in the literature. I have thought best to depict all three main studies, redrawn in section *D* (Fig. 2), in order to show how little they vary in essentials. The Siegel line is much smoother than the other two near it, though constructed partly from the same records, and not exceeding the others enough in numbers to account for some rather marked differences. The height during menstruation should be noted.

Pryll omits Siegel's cases from his chart, and gives graphs of 7 of the 11 authors he draws upon. Four of these 7 resemble the Zangemeister and Pryll lines in our graph and Siegel's chart of his 125 cases, in that there appears a secondary rise between the thirteenth and the eighteenth day, centering on the fifteenth and thus not far from Henson's average of the fourteenth and Jaeger's rise, and the main group of embryo indications. This secondary wave of fruitful cohabitation comes close to the ovulations shown in section *C* (Fig. 2). This group of cohabitations calls only for one to four day life of sperm within the female passages, as against seven to thirteen days with the group represented by the earlier peaks. The striking thing in the *C* and *D* sections (Fig 2), and the chief puzzle in human reproduction thus graphically pictured for the first time, is the gap between the highest frequency of isolated fruitful coitus and of ovulation according to laparotomy evidence. The explanation that ovulation may be induced by orgasm we have suggested.

Issmer, drawing his material from the Munich "Frauenklinik," reports on 472 patients giving both date of period and of conception. As pregnancies starting during the period, he lists only 1.5 per cent, and for the premenstrual week 9.07 per cent. The first week takes 37.07, the second week 35.36, or 72.43 per cent in the first half. Jaeger's premenstrual group comprises 10 per cent of his 110 patients, and the menstrual 13.3 per cent. Hensen (quoted in Zweifel) found in 248 cases of known single coitus, that 86 per cent ran in the neighborhood of the fourteenth day.

The Jaeger line is given as an example of the need of large numbers to secure better averages and to show the presence of premenstrual conceptions even in a small series. The embryo grouping derived from estimates of ages of early examples, as shown in the shaded blocks marked "ZE" at the bottom of section *D* (Fig. 2), also runs over into the premenstrual. The terms "premenstruum," "postmenstruum" and "interval" are drawn from various German charts and tests. How fixed they are in custom I do not know. Some German authors specify the whole week when they speak of premenstrual conceptions. The percentages at the bottom of section *D* (Fig. 2) therefore are not always comparable.

There is general agreement on five matters: (1) Conception can occur at any part of the month. (2) There is very marked difference between favorable and unfavorable periods. (3) The week or ten days following menstruation is the time of greatest likelihood of conception. (4) The week preceding menstruation presents the least chance of conception, averaging about 7 per cent, or, in various lists, 3, 6, 9, 9.3, 10 per cent. (5) Conception during menstruation is relatively frequent, about 13 per cent.

The chief surprise, I believe, will be the relatively marked fertility shown to exist during menstruation. In view of the common avoidance of intercourse during the period, the percentages here quoted may indicate a lower capacity for conception than actually exists. The figures on the base of chart *D* (Fig. 2) show 13, 15, 13.3 per cent and to these may be added Ahlfeld's 13.2 per cent in 219 cases. Issmer's were 9.97 for this time, Siegel's still higher. The observation will have this practical outcome, that we shall advise those patients who have no other evident cause for sterility not to neglect coitus during the period, and indeed, to draw the attention of all patients except those with sealed tubes to the possibilities in this nearly forgotten field. Menstrual blood is a particularly favorable medium for persistence of motility of the sperms (Hoehne) and low or brief motilities may take notice. Zangemeister's is the fullest statistical study of fruitful intercourse. Several of the papers listed deal largely with considerations of male or female children resulting from coitus at various parts of the cycle, on the length of pregnancies and the weight of babies and the relation between day of fruitful intercourse and day of menstruation and the date of delivery. We are here concerned only with the matters having to do with a "safe period," and take up elsewhere duration of life in sperms and ova.

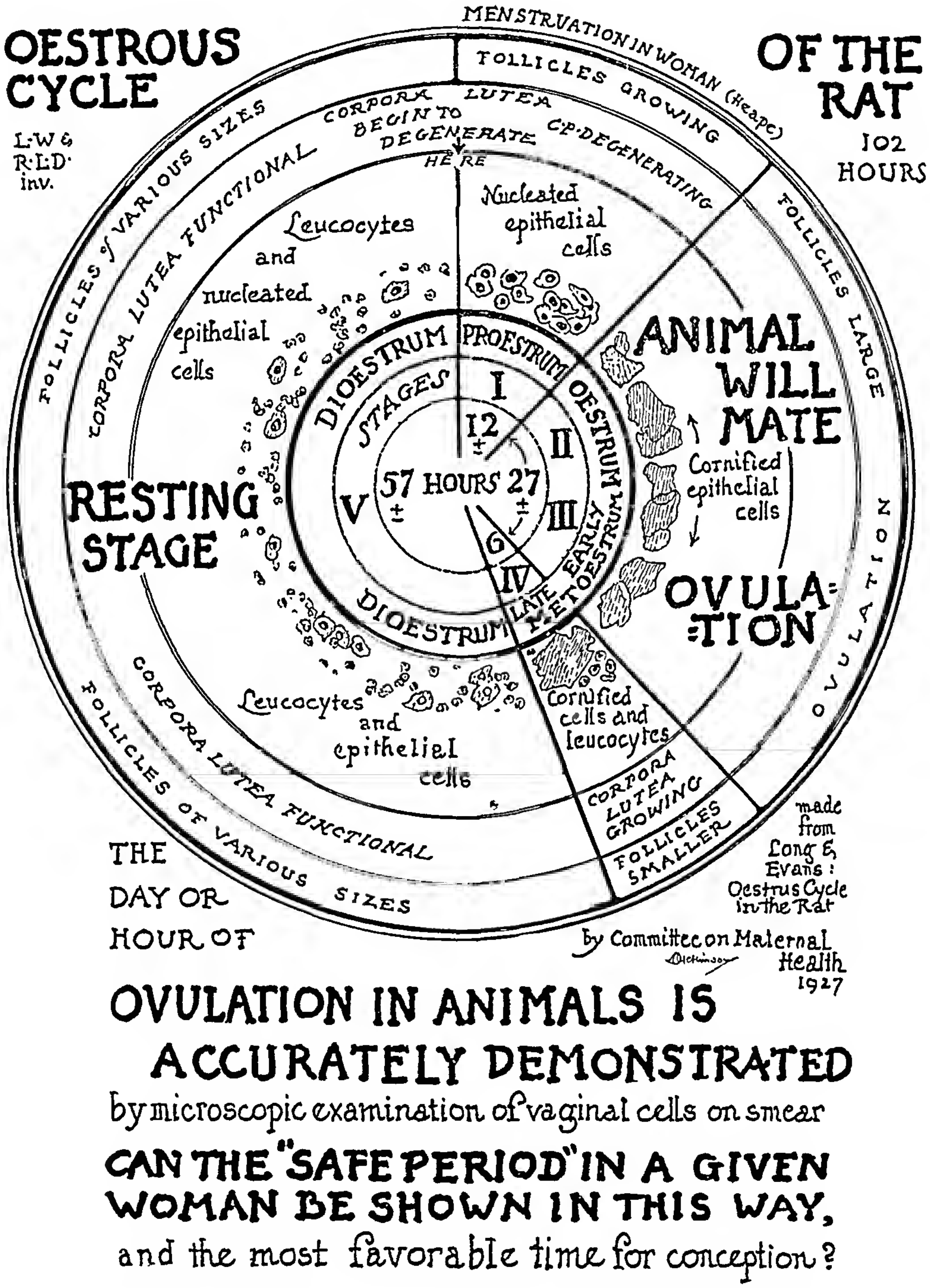
OESTROUS CYCLE
OF THE RAT
L·W & R·L·D· inv.
102 HOURS
MENSTRUATION IN WOMAN (Heape)
FOLLICLES GROWING
CORPORA LUTEA BEGIN TO DEGENERATE HERE
C.P. DEGENERATING
FOLLICLES LARGE
FOLLICLES OF VARIOUS SIZES
CORPORA LUTEA FUNCTIONAL
Leucocytes and nucleated epithelial cells
Nucleated epithelial cells
ANIMAL WILL MATE
Cornified epithelial cells
OVULATION
OVULATION
RESTING STAGE
DIOESTRUM
STAGES
PROESTRUM
OESTRUM
EARLY METOESTRUM
LATE
DIOESTRUM
I
II
III
IV
V
12 ±
57 HOURS 27
±
±
6
Cornified cells and leucocytes
Leucocytes and epithelial cells
CORPORA LUTEA GROWING
FOLLICLES SMALLER
CORPORA LUTEA FUNCTIONAL
FOLLICLES OF VARIOUS SIZES
THE DAY OR HOUR OF
made from Long & Evans: Oestrus Cycle in the Rat
by Committee on Maternal Health 1927
Dickinson
OVULATION IN ANIMALS IS ACCURATELY DEMONSTRATED
by microscopic examination of vaginal cells on smear
CAN THE "SAFE PERIOD" IN A GIVEN WOMAN BE SHOWN IN THIS WAY,
and the most favorable time for conception?

Fig. 4.—The Oestrus Cycle of the Rat. (From Long and Evans.)

Early Embryos.—Fraenkel has collected, in Liepmann's *Handbuch*, the evidence based on embryos, and lists them between the second and twenty-fourth day, 9 before and 12 after the fifteenth day. Our section *E* (Fig. 2) is made up from Zangemeister. The largest group falls between the fourteenth and sixteenth day as pointing to the day of ovulation. Grosser's studies merit careful consideration.

Tubal Cycle.—The lining of the tube is smooth in pigs when the egg is passing. Snyder finds the corresponding state of the epithelium in the human tube at the thirteenth day. As to tubal contractions, the behavior is indicated in section *F* (Fig. 3) of the graph. The tubes are never seen contracting at laparotomies, but found by the fluoroscope, after injection of iodinized oil, to be always in regular peristaltic activity. Rubin, when making insufflation tests, now registers the waves graphically on a drum, and recognizes differences at different parts of the interval. When removed at operation, and a section hung in solution, the waves are shown by Seckinger and Snyder to be of differing amplitude, speed and groupings. I have taken these authors' waves and placed them end to end that we may visualize the slow contractions at uniform amplitudes at all times except between the tenth and twenty-second day. Sweep and speed are nearly doubled between the sixteenth and twenty-second days, and the action then falls into groupings. As action of this kind is known to occur in the pig (Seckinger) and the monkey (Corner) where the association of it with the passing of the ovum may be made, it is one more indication of the date of ovulation. Sobotta says the stay of the ovum in the tube is singularly uniform, averaging three days, with no relation to size of animal, length of pregnancy, size of the ovum in mammals, or the development while in the tube. The dog is an exception. "So far as known, fertilization always takes place in the tube," says Corner.

The Vaginal Cycle.—In the variety of animals that have been studied since their observations on the guinea pig were brought out by Stockard and Papanicoloau in 1917, the vaginal epithelium is found to undergo alterations which clearly indicate the processes going on in the ovary, and point to the exact time of ovulation. How marked the changes and how great the contrasts may be, as shown by a simple vaginal smear, is to be noted in section *I* (Fig. 3) and in Fig. 4, where we have borrowed from Long and Evans the evidence in the rat. The hope of findings of equal sharpness in the woman has not been borne out by the elaborate (unpublished) studies of Papanicoloau, initiated by our committee, with a considerable number of patients, although he believes he is on the track of important indications. The 11 women recently studied by Jessie King showed no definite cycle. It is evident that many virgins with one-finger, sharp-edged hymens must take swabbings, and much evidence must accumulate, before any statement can be made. Then we may possibly find indications in the human vagina of a point of high fertility, and one of a nonfertile period, either for laying down general rules or for regulating one individual at a time.

In a personal communication, R. T. Frank, discussing ovarian hormones in the blood, says that the results from the blood of the human female would indicate that throughout sexual life the female sex hormone is circulating in the blood. Approximately ten to twelve days before the next impending menstruation, a sudden rise of the amount of hormone circulating in the blood is noted, this rise persisting until the onset of the flow. We interpret the onset of this increase as corresponding with the rupture of the follicle and the absorption en masse of the follicle fluid, and the continued increase, as the effect of secretion from the corpus luteum. We therefore place the time of ovulation as approximately midway between the onset of two periods which corresponds sufficiently closely with the latest morphologic data.

Correlating these data with the data obtained from animals, it would appear that the most favorable time for conception would follow coitus occurring approximately two weeks before the next expected period. Conversely, the least favorable time for conception should be immediately after menstruation as well as the week preceding the expected menses. Statistic studies, however, would indicate that no "safe period" may occur in the human being. This would signify that either the human spermatozoa survive over a longer period than those of lower animals, or that the human ovum survives longer, or that both of these conditions obtain.

SUMMARY

1. There is no time in the month at which conception has not occurred in some women.

2. The premenstrual week constitutes the relatively "safe period," or "low-risk period," when the average chance of pregnancy is less than one in ten.

3. A "safe period" or sterile part of the cycle is present in every woman, but is a matter for individual tests, and such successful tests are not yet effectively transferable from animals. Nor has any series been studied that is made up of adequate case records of women with known "safe periods."

4. The height of fertility belongs to the week or ten days following menstruation.

5. Fertility is relatively high during menstruation. For the four days that make up 14 per cent of the average menstrual cycle, conceptions from isolated coitus have amounted to 13 per cent.

6. Abdominal operations point to ovulation between the fourteenth and nineteenth days from the beginning of the period—rarely thereafter. Coitus may possibly free the ovum earlier.

7. Alterations in rhythm of tubal contractions and in the tube lining point to passage of the ovum subsequent to the above days and up to the twenty-second day.

8. New evidence shows coincidence of maximum sex desire and maximum well-being with minimum chance of conception, in the premenstrual week; also a secondary wave of desire at the time of greatest fertility.

The complete paper, from which this has been condensed, appears in the author's reprints, which may be obtained from the office of the Committee.

REFERENCES

Ancel and Villemin: C. R. Soc. biol., Paris, 1907, lxiii, 200. *Blumenfeld, E.:* Monatschr. Geburtsh. and Gynäk., 1925, lxviii, 302. *Chazan:* Zentralbl. f. Gynäk., 1911, p. 648. *Corner:* Oestrus, Ovulation and Menstruation, Physiolog. Rev., 1923, iii, No. 4, p. 470; Contrib. to Embryol. Carnegie Inst., Saunders & Co., 1923, No. 3321, pp. 73-101. *DeLee:* Practice of Obstetrics, 1917, p. 17. *Evans:* Barker, Hoskins and Mosenthal's Endocrinology, 1922, ii, 580. *Frank:* Jour. Am. Med. Assn., 1925, lxxxv, 510. *Fraenkel:* Arch. f. Gynäk., 1903, lxviii, 438, and 1910, xci, 705; Ztschr. f. Geburtsh. u. Gynäk., 1913, lxxiv, 107; Berlin. klin. Wchnschr., 1920, p. 23; Halban-Seitz, Biol. Path. d. Weibes, 1924, i, 577; Liepmann Handb. d. Gesamt. Frauenkr. iii, 71. *Giles:* Menstruation and Its Disorders, London, 1901. *Grosser:* Anat. Anz., 1915, xlviii, 92; 1918, l, 489; Arch. f. Gynäk., 1919, cx, 297-326. Med. Klinik, 1924, xx, No. 2, p. 1466. *Halban u. Kohler:* Arch. f. Gynäk., 1914, ciii, 575. *Hammond, J., and Asdell:* Brit. Jour. Exp. Biol., 1926, iv, 155-185. *Hasler:* Dissert. Zurich, 1876 (quoted Arch. Gynäk., ci, 610). *Hensen, V.:* Ztschr. f. Anat. u. Entwickl., 1876, pp. 213 and 353. *Hoehne:* Verh. d. Deutsch. Ges. für G. and G., 1913, ii, 514; Zentralbl. f. Gyn., 1914, xxxviii, 1. *Issmer:* Arch. f. Gynäk., 1889, xxxv, 344. *Jaeger:* Zentralbl. f. Gynäk., 1917, p. 857. *King:* Pub. Carnegie Instit., 1927, No. 363, pp. 79-94. *Leopold and Ravano:* Arch. f. Gynäk., 1907, lxxxiii, 556. *Long and Evans:* Univ. Calif., 1922, vi, 1-148. *Marcotty:* Arch. f. Gynäk., ciii, p. 63. *Marshall:* Introd. Sex. Phys., p. 57. *Meyer and Ruge II:* Zentralbl. f. Gynäk., 1913, xxxvii, 50. *Nuernberger, L.:* Deutsch. med. Wchnschr., 1919, No. 7, pp. 432, 895. Monatsch. f. Geburtsh. und Gynäk., p. 53. *Pryll, Walter:* Muenchen. med. Wchnschr., 1916, lxxxiii, No. 470, p. 1579; Ztschr. f. Geburtsh. u. Gynäk., 1916, lxxix, 530. *Rensch:* Arch. f. Gynäk., 1916, cv, 262. *Ruge:* Arch. f. Gynäk., 1913, c, 20; Arch. f. Gynäk., 1918, cix, 302. *Schroeder, R.:* Arch. f. Gynäk., 1914, ci, 1; Arch. f. Gynäk., 1915, civ, 27-102. *Schickélé, G.:* Obst. et Gynec., 1922, v, no. 6, p. 590. *Seckinger and F. Snyder:* Johns Hopkins Bull., Dec., 1926, xxxix, No. 6, p. 371. *Seitz und Wintz:* Monatschr. Geburtsh. u. Gynäk., 1919, i. *Siegel, P. W.:* Deutsch. med. Wchnschr., 1915, xlii, 3; Muenchen. med. Wchnschr., lxi, 21; Zentralbl. f. Gynäk., 1921, xxviii, 985; 1924, xlvii. *Snyder, Franklin F.:* Bull. Johns Hopkins 1924, xxxv, 399, 141-146. *Sobotta.:* Anat. Anzeig. 1914-15, xlvii, 448; Arch. f. Gynäk., 1918, cix, 302, 602. *Stockard and Papanicoloau:* Biol. Bull., 1917, xxxvii, 222. *Triepel:* Anat. Anz., 1915, xlviii, 133; Lehrbuch d. Entwicklungs gesch., 1917; Anat. Anz., 1919, lii, 225. *Tschirdewahn, F.:* Ztschr. f. Geburtsh., u. Gynäk, 1921, lxxxiii, 80 and 102. *Villemin:* Le Corps Jaune considéré comme glande à sécretion interne de l'ovaire, Paris, Doin, 1908. *Zangemeister:* Arch. f. Gynäk., 1917, cvii, No. 3, pp. 405-469. *Zweifel, E.:* Arch. f. Gynäk., 1922, cxvi, No. 1, 141.

(For discussion see page 836.)

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BLOOD BILIRUBIN IN ECTOPIC PREGNANCY

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THEORETICAL CONSIDERATIONS

THE clinical diagnosis of ectopic pregnancy so often proves difficult that a differential laboratory test would be most welcome. Such a test might be expected to show either a biologic phenomenon characteristic of pregnancy, or one diagnostic of intraabdominal hemorrhage.

Relatively little attention has been paid to the fate of the extravasated blood in cases of ectopic pregnancy. Some of the blood may be absorbed from the peritoneal cavity unchanged, just as we assume the course to be when blood transfusions are given intraperitoneally. Some of it undergoes disintegration, with a liberation of the hemoglobin from the red blood cells, followed by a breaking down of the hemoglobin into simpler substances.

In the first volume of his Archiv, published in 1847, Virchow[1] mentions finding yellowish-brown crystals in old hemorrhagic extravasations in various parts of the body. Rokitansky had found these crystals previously but had failed to recognize their nature. Virchow realized that he was dealing with a product of changed blood pigment, hematoidin. This hematoidin has since been proved[2, 3] to be identical with bilirubin, the yellowish pigment normally present in human blood serum and bile.

Since Virchow's time, so many observations have been reported of local bilirubin formation in blood extravasations, that the process is generally recognized as one which occurs in every hematoma, and with surprising rapidity. Froin,[4] in 1906, reported the finding of bilirubin in 53 of 178 hemorrhagic fluids from the peritoneum, pleura, and cerebrospinal space. Guillain and Troisier[5] found bilirubin in the chest fluid from hemothorax cases, and in the spinal fluid from cases of cerebral hemorrhage. Van den Bergh and Snapper[6] found in hemorrhagic fluids, always a much greater concentration of bilirubin than was present in the patient's blood. In some hematomas, Van den Bergh[7] found bilirubin in as great a concentration as it occurs in bile. Others, notably Blankenhorn,[8] report similar findings.

In 1914, Van den Bergh[6] attacked the problem experimentally by injecting hemoglobin solution under the scalp of dogs. Two or three days later, the aspirated fluid contained bilirubin which, however, never appeared in the peripheral blood. Whipple and Hooper, in 1916[9] injected hemoglobin into the pleural or peritoneal cavities of dogs, and found that a prompt transformation into bilirubin occurred. This was manifest at the end of eight hours, and within twenty-four hours, a considerable amount of bilirubin had been formed. Leschke[10] found bilirubin in human spinal fluid within a few days after blood had been injected into the cerebrospinal space.

From the above-quoted observations, it is safe to infer that bilirubin may be formed in the intraperitoneal blood extravasations of cases of ectopic pregnancy, and sometimes in large amounts. It is of great physiologic and clinical interest to know what becomes of this bilirubin, and of the unchanged hemoglobin, as well as the intermediate substance, hematin, that accompanies them. Does it remain in situ and form the crystals which Virchow observed? Is it absorbed and if so, rapidly enough to stain the body fluids and tissues to an abnormal degree, even to cause jaundice? How promptly is it excreted?

Some months ago we examined a specimen of bloody pericardial fluid removed from a patient with Gaucher's disease who had a large pericardial effusion. The fluid contained a very large amount of bilirubin yet the patient's blood bilirubin was normal.

Van der Bergh and Snapper[7] reported several cases illustrating this phenomenon. One patient had a traumatic hemarthrosis. The joint fluid contained bilirubin in a concentration of one part to 2,300,—as great as it is found in bile. The peripheral blood of this patient showed but a trace of bilirubin. Another patient had a pleural neoplasm. The bloody pleural fluid contained bilirubin, one part to 30,000, while the peripheral blood contained one part to 360,000 (normal amount). Blankenhorn[8] studied a case of traumatic hemothorax resulting from a stab wound four days before admission to the hospital. The plasma from the bloody pleural effusion contained a very large amount of bilirubin, whereas the patient's peripheral blood contained practically none. Rich[3] examined the fluid from a large omental cyst, which he found to contain an enormous amount of bilirubin, whereas the patient's blood had an unusually low bilirubin content. In cases such as these, in which high concentrations of bilirubin have been formed in hemorrhagic fluids, there appears to have been little absorption of the pigment, rather, a local storage of it. Blankenhorn[8] believes that this occurs because bilirubin is held "adsorbed" in the plasma of the hemorrhagic fluid to a remarkable degree. He demonstrated that there was no diffusion of bilirubin from such plasma contained in a collodion sack, into the surrounding water. "Some unknown change in the plasma occurs, to heighten its adsorptive power for bile pigment when blood escapes into a serous cavity in a healthy person."

The rate of absorption of hemoglobin and bilirubin from the intraperitoneal blood extravasations of ectopic pregnancy cases is not known. Direct observation is lacking, conditions associated with other hemorrhagic extravasations are not strictly analogous, nor has the experimental work thus far reported, reproduced the conditions which obtain in patients with ectopic pregnancy.

Tarchanoff,[11, 12] in 1874, demonstrated in dogs with biliary fistulae, that there was a prompt increase in bile pigment excretion after the intravenous injection of hemoglobin or bilirubin solutions. Stadelmann[13] confirmed these results. He found that the increased pigment excretion began at once after the bilirubin injections and continued for five hours. Following hemoglobin injection, the bile pigment output began to increase in three or four hours, and the increase lasted twenty-four hours. Stadelmann[14] obtained almost as rapid bile pigment excretion after intraperitoneal injections of hemoglobin, as he had after intravenous injections. The conclusions from these classical experiments form the basis of our present conception, recently formulated by Rich[15]: "If the quantity of plasma bilirubin be temporarily increased by any means which does not at the same time impair or overstrain the excretory function of the liver, the liver will promptly excrete the excess of pigment until the normal level of plasma bilirubin has been reached again.''

PREVIOUS OBSERVATIONS WITH ECTOPIC CASES

In 1884, Dick[16] reported 3 cases which presented the clinical picture of ruptured ectopic pregnancy with severe intraperitoneal hemorrhage, associated with an icteric appearance of skin and conjunctiva. In one case, posterior colpotomy proved the diagnosis of intraperitoneal hemorrhage. In each case the urine contained an abundance of urobilin, but no bilirubin. Dick considered the urobilinuria to be the result of intraperitoneal blood disintegration, and the cause of the icterus.

Schiller and Ornstein[17] recently reported a study of urobilinogenuria in normal and in ectopic pregnancy, in a large series of cases. They obtained positive results in 10 per cent of suspected ectopics and in 80 per cent of a series of 63 proved ectopic pregnancy cases. In analyzing their material, they concluded that urobilinogenuria is found in ectopic pregnancy when active bleeding is going on, or has occurred within two or three days.

In 1909, Lodewijks[18] reported a case of ruptured ectopic pregnancy at four months, associated with anemia and icterus. No blood or urine examinations were reported.

Schottmüller,[19] in 1914, reported four cases of ectopic pregnancy associated with icterus, in which hematinemia was demonstrated (by Schumm) on spectroscopic examination of the blood serum. The first case presented the clinical features of a ruptured ectopic, with marked anemia and a yellowish coloration of the skin. The blood serum was yellower than normal, and contained much hematin. Hemoglobinuria and methemoglobinuria occurred also. This patient recovered without operation. A second patient also had a ruptured ectopic, with severe anemia and slight icterus of the conjunctiva. Hematinemia was demonstrated. Operation verified the diagnosis. Two other cases, with history and findings diagnostic of a simple adnexal tumor, were observed to have an icteric appearance. On spectroscopic examination of the serum, hematin was reported, whereupon both cases were diagnosed as ectopic pregnancy and cited to show that pigmentation of the conjunctiva and hematinemia may occur in ectopic pregnancy even when there has been no demonstrable intraperitoneal hemorrhage. Both patients got well without operation, so that we have no further proof of the diagnosis. Schumm[20] who had done the spectroscopic work on the sera of these patients, later examined the sera of five other patients with ectopic pregnancy and could find hematin in none.

In 1920, Norris[21] reported two patients with ruptured ectopic pregnancy who had observed themselves to become jaundiced, and who looked icteric. The diagnoses were verified at operation, about a pint of blood being found in the peritoneal cavity of each case. On the third or fourth day after operation, the icteric appearance was no longer observed. The clinical determination of transient jaundice is notoriously uncertain, because pallor exaggerates the normal pigmentation of the skin. In such cases, the diagnosis of jaundice should be substantiated by a quantitative examination of the blood plasma for bilirubin by some reasonably accurate method. No examinations were performed in these cases. A third patient with ectopic pregnancy reported in the same article had no jaundice, but bilirubin was demonstrated in blood serum and urine by the Gmelin test. Bilirubinuria in hemolytic jaundice cases is so exceptional (hence the term acholuric jaundice) that it is possible in this case it was due to some coincidental liver disturbance.

In a paper on the icterus index of the blood serum, in 1924, Dr. Alice Bernheim[22] reported the finding of high values in the peripheral blood of two cases of ectopic pregnancy. This so-called icterus index is an expression of the color intensity of a specimen of serum as compared to that of a standard. In the above-mentioned work, a 1 : 10,000 solution of potassium bichromate was used as standard, with a Bock-Benedict colorimeter (method of Meulengracht,[23] modified by Maue[24]). The high color of the sera of these ectopic pregnancy cases was certainly suggestive, and stimulated investigation to determine whether such findings were constant, and characteristic of this condition. Dr. Kross, of the Mount Sinai Hospital gynecological staff, has examined the blood of cases of ectopic pregnancy by the above method and considers it a valuable diagnostic test. In April, 1925, Hawks[25] reported the experience with the icterus index test in ectopic pregnancy cases at the New York Hospital. "The icteric index has been taken in a few cases lately and is principally of negative value. A low or normal reading in the presence of a mass, reasonably rules out blood-clots. A high reading with a good picture otherwise, may be of slight positive value."

The color of human blood serum is due chiefly to the yellow pigment, bilirubin, which is formed within the body as a result of the breaking down of hemoglobin. Hemolyzed or cloudy specimens of serum must, of course, be rigidly excluded, if color intensity of the serum is to be used as an index of its bilirubin content. Hemolysis is the great pitfall in icterus index determinations, for the slightest trace of hemolysis changes both the quality and intensity of the color of the serum. Traces of hemolysis are readily recognized by the experienced observer, from the slight reddish tint imparted to the serum by the dissolved hemoglobin. If in doubt, one can immediately identify oxyhemoglobin, when present, by means of a small hand spectroscope, as Meulengracht[23] advised. The two characteristic absorption bands of oxyhemoglobin are unmistakable. If carrots are eaten in excess, the yellow vegetable pigment, carotin[26] may color the blood serum much more deeply than normal. Perfectly clear and nonhemolyzed sera from relatively normal patients on a general diet may have the same color (icterus index) and yet vary considerably in bilirubin content (as shown by the Van den Bergh test). Evidently the yellow color of the serum with less bilirubin has been augmented by the presence of other yellow pigment. The presence of this variable amount of unidentified yellow pigment in human blood serum is an uncontrollable source of error in bilirubin estimations by the icterus index test.[27, 28] In cases of jaundice, this factor is dwarfod into insignficance by the relatively large amounts of bilirubin present, but with the lower bilirubin concentrations, it is a factor not to be disregarded.

The recent articlo of Bang[20] on bilirubinemia should be mentioned, because three cases of ectopic pregnancy aro included in his series. Blood serum was examined by the Gmelin-Sunde method. Tho serum is layered over nitric acid containing a little sodium nitrite, whereupon a whitish contact zone of coagulated albumin develops. If a bluish-green ring appears, within this zone, it is taken to indicate the presence of bilirubin, and the more promptly it appears, the more bilirubin is thought to be present. The formation of the green ring within a half hour is considered to indicate an abnormal bilirubinemia. This was found in every ono of ten cases of acute appendicitis, in seven out of nine cases of chronic appendicitis, in four out of sixteen patients with salpingitis, in each of fourteen cases of fracture or contusion, in each of three cases of ectopic pregnancy, and in 37 per cent of a series of patients with miscellaneous maladies. Clinically, it was certainly not a specific test. Chemically it is not specific because lutein substances in the serum may cause the same green ring.[27] It is not a sensitive test, for it does not demonstrate the bilirubinemia which we know to occur normally, and which is easily demonstrated by more delicate methods. (Van den Bergh.[27])

ORIGINAL INVESTIGATIONS (METHOD)

In 1925, at the suggestion of Dr. S. H. Geist, we began to examine the blood sera of patients with ectopic pregnancy by the quantitative method of Van den Bergh,[27] which is a specific, sensitive test for bilirubin.

A half c.c. of serum is required for the test. To it is added 1 c.c. of absolute alcohol, which causes a precipitation of serum proteins. After centrifuging, the clear supernatant fluid is poured off, and to it is added ¼ c.c. of Ehrlich's diazo reagent. A violaceous color (azo-bilirubin compound) results, its intensity dependent upon the amount of bilirubin present. This color is compared with that produced by the addition of the diazo reagent to a standardized solution of pure bilirubin (isolated by one of us from human bile drainage). The standard must be freshly prepared each time. A simple dilution colorimeter is used, consisting of two long graduated 10 c.c. tubes and a ground glass background. The results are expressed in mg. of bilirubin per 100 c.c.

With the Van den Bergh test, some bilirubin is carried down with the protein precipitate, by adsorption. In normal sera this is an insignificant loss, but in obstructive jaundice cases it may be considerable, and result in quantitative estimations which are too low. In hemolytic jaundice, however, the percentage of bilirubin loss with the protein precipitate is the same as occurs normally. Van den Bergh observed this fact, which has been confirmed by many subsequent observers, including Feigl and Querner,[30] Lepehne,[31] Meulengracht,[23] and Thannhauser and Andersen.[32] For the determination of blood bilirubin values in conditions associated with blood destruction (such as ectopic pregnancy) the Van den Bergh method is therefore ideally suitable.

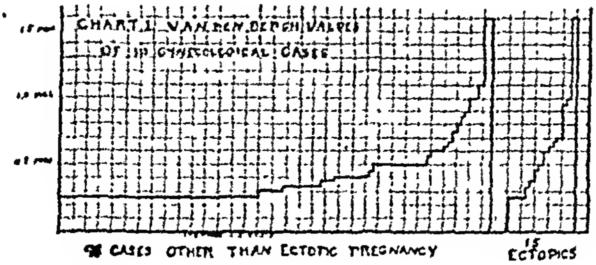
In addition to carrying out bilirubin determinations by the Van den Bergh method, we examined all nonhemolyzed sera by a modified icterus index method similar to that of Meulengracht.[23] A small dilution colorimeter was used, similar to the Sahli hemoglobinometer, and 1 c.c. of the patient's serum was diluted to match Kuttner's permanent standard. This standard reproduces the color of a solution of pure bilirubin of definite concentration, so that the color intensity of the serum specimen which has been diluted to match it, is read off directly as the number of mg. of bilirubin per 100 c.c. that would produce that color intensity. This is not the actual bilirubin content of the serum, but the amount it would contain, if the yellow color were produced by the bilirubin alone. The values so obtained are readily compared with those from the specific bilirubin test (of Van den Bergh) applied to the same sera, demonstrating (as mentioned previously) the considerable, variable quantities of yellow pigment other than bilirubin, that may occur in normal human sera.

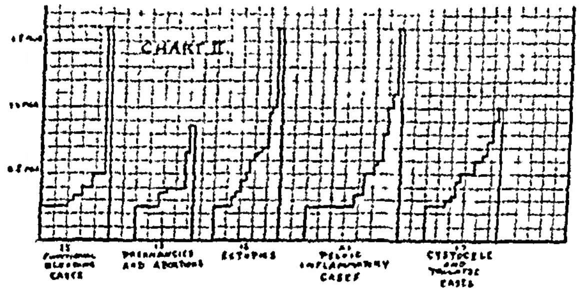
The specimens of blood were taken from one of the peripheral veins, the same as for the Wassermann test. There was no constant relationship to meals, because in the cases of suspected ectopic pregnancy, the blood specimens were taken at the time of admission to the hospital.

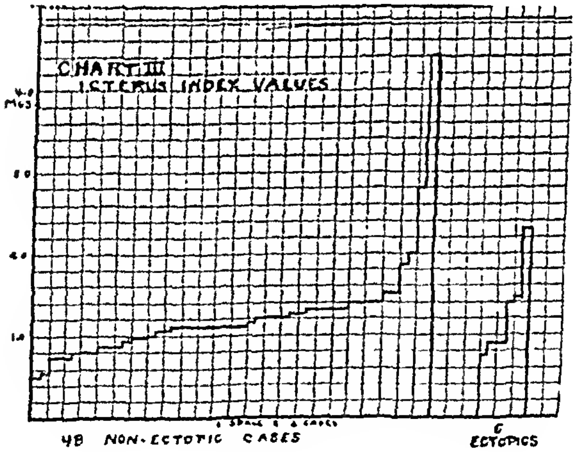
The "normal" range of blood bilirubin values found by Van den Bergh, 0.25 to 0.5 mg. per 100 c.c., is considered too low by a number of other workers, notably Botzian,[33] Mandelbaum,[34] Green,[35] and Förster and Förstner.[36] It was therefore necessary for us, in order properly to evaluate our results with the ectopic cases, to perform the same examinations on the sera of a control group of other gynecologic patients. This we did routinely in a series of 130 consecutive admissions to the gynecologic service. Of this control group, in only 98 were the diagnoses satisfactorily established, and the determinations from these only, will be considered here. Up to the present we have examined, before operation, blood serum specimens from 15 cases of ectopic pregnancy, all tubal, each verified by operation and subsequent pathologic examination. The clinical history and operative findings of each ectopic pregnancy case are briefly given below, together with the blood bilirubin values.

RESULTS

Our results are best shown graphically, by means of three charts. In Chart I, the bilirubin (Van den Bergh) values of our 15 ectopics are plotted beside those of the other 98 gynecologic cases. The number of cases is represented by the abscissae, and the mg. of bilirubin by ordinates. In Chart II, the bilirubin (VDB) values of the ectopic group may be compared with those of other groups represented in the 98 control cases. In Chart III, the icterus index values of 6 ectopics are plotted beside those of 48 other gynecologic patients. Because of hemolysis, the sera suitable for the icterus index test were relatively few. In some ectopic cases, several preoperative bilirubin determinations were made, sometimes with different results. We might have plotted the mean of the several observations in such a case, but chose instead to use the highest value.







It is apparent from a glance at these charts that ectopic pregnancy cases cannot be identified by their blood bilirubin values. High values are found in ectopics and in nonectopics, and in about the same proportion. Why there was hyperbilirubinemia in some of our control cases, in the absence of biliary, hepatic, or hemolytic disease, we do not know. Such cases presented no apparent clinical or pathologic features in common. Some of them probably belong to the group designated by Van den Bergh[27] as "physiologic hyperbilirubinemia," but they were more frequent than in his series, so that our findings agreed with those of the other workers previously referred to.[33-37] A summary of the clinical features of each control case with a blood bilirubin value above 0.6 mg. per 100 c.c., is given below.

Of the ectopics, Case 7 is of particular interest. This patient came into the hospital for the repair of a cystorectocele. An ovarian cyst had been felt in the routine examination, but there were no symptoms suggestive of extrauterine pregnancy. Her routine preoperative blood examination revealed a high bilirubin content (1.6 mg. per 100 c.c. by the Van den Bergh test). Following the plastic operation, laparotomy, undertaken to effect ventrofixation of the uterus, revealed old blood in the abdomen, the left tube being the seat of a pregnancy. The coincidence in this case, of hyperbilirubinemia and old blood in the pelvis, made it tempting to reason *post hoc, ergo propter hoc,* and ascribe the hyperbilirubinemia to the presence of the extravasation. A critical consideration of our other cases, however, brings out these facts:

1. An equally high figure was obtained in a pelvic inflammatory case, and in a patient with functional metrorrhagia.
2. The remaining 14 ectopics had no higher values than the inflammatory cases, or the cystocele and prolapse cases.
3. The two unruptured ectopics (Cases 10 and 11) with no free blood, had elevated values, whereas a number of cases with old blood in the pelvis had low values (Cases 2, 4, 12, 13).

Of the control groups, the metrorrhagias, the pregnancies and abortions, and the pelvic inflammatory cases at times present clinical pictures difficult to distinguish from ectopic pregnancy; in fact, a few of these cases were so interpreted and the patients operated upon. Some of the confusing cases had low bilirubin values; a few had elevated values. One of these was especially interesting. The patient was a woman thirty-two years old who complained of pain in the right lower quadrant of the abdomen for two weeks. She had passed the time of her last menstrual period due three weeks before, since which time she had been spotting, and complained of pain in the abdomen. On examination, the cervix was soft and the uterus enlarged to the size of a six weeks' gravidity; the right adnexa felt doughy. The blood bilirubin, by the Van den Bergh method, was found to be 0.87 mg., a high figure. She was operated upon four days later with a preoperative diagnosis of ectopic pregnancy. At operation, right ovarian and parovarian cysts were found. The tubes were normal and four days after operation, she expelled from her uterus a normal fetus.

It is interesting to notice that the last patient of our series (Case 15) was found clinically to have an icteric appearance, but her blood serum was quite pale, and poor in bilirubin, as shown by both icterus index and Van den Bergh tests. This exemplifies the fact previously referred to, that anemia accentuates the normal pigmentation of the skin, *and may give a deceptive impression of jaundice.*

SUMMARY

1. There is probably a local formation of bilirubin from hemoglobin in the hemorrhagic extravasations of some cases of ectopic pregnancy.

2. It has not been determined how quickly this bilirubin is formed, or how rapidly it is absorbed.

3. The normal liver promptly removes any excess of bilirubin from the circulating blood, by excreting it into the biliary passages.

4. In cases of ruptured ectopic pregnancy, icterus may be simulated because of the anemia.

5. Hyperbilirubinemia, in the absence of biliary, hepatic, or hemolytic disease, is not infrequent.

6. Blood bilirubin values are no different in ectopic pregnancy cases than in other gynecologic patients.

CONCLUSION

Ectopic pregnancy cannot be diagnosed by determinations of the bilirubin concentration of the peripheral blood.

CLINICAL HISTORIES OF ECTOPIC CASES

CASE 1.—Admitted 10/23/25. The patient had her last regular menstrual period nine weeks before admission. After five weeks' amenorrhea, profuse bleeding began, then sharp pains in the right lower quadrant. She fainted on the third day, after which the pain subsided but both pain and bleeding persisted for the month before admission. On examination, a cystic mass was felt to the left of the uterus in the culdesac.

10/14/25 Blood bilirubin (Van den Bergh) 1.0 mg. Direct VDB slightly positive, delayed.

10/15/25 Blood bilirubin (VDB) 0.5 mg.

10/15/25 At operation, there was a small amount of clotted blood in the culdesac, and an orange-sized cyst of the right ovary. The right tube showed a thickening near its fimbriated end (tubal pregnancy).

CASE 2.—Admitted 9/30/25. Patient's husband had a Neisserian infection in 1920. She had had irregular bleeding associated with lower abdominal pain, vomiting, and faintness for a week preceding admission. On examination, there were signs of pelvic peritonitis, but no pelvic mass was felt. No operation was performed.

10/21/25 Readmission. Four days before right lower quadrant pain and faintness returned and the patient complained of weakness. On examination, in addition to previous findings, there was now a very tender mass to the right of the uterus and posteriorly.

10/21/25 Aspiration of the culdesac; a bloody froth was obtained.

10/23/25 Blood bilirubin (VDB) 0.5 mg.

10/26/25 At operation, blood clots were found on the left side of the pelvis. The uterus was enlarged to the size of seven weeks' gravidity and felt soft. On the right side was a mass the size of a large orange consisting mostly of blood clot and edematous broad ligament (ectopic gestation).

CASE 3.—12/12/25. Private patient of Dr. X., ruptured tubal pregnancy. Blood bilirubin (VDB) 0.37 mg.

CASE 4.—Admitted 2/26/26 complaining of menorrhagia, suprapubic pain, and burning urination for two weeks. On examination, a cystic right adnexal mass was felt.

3/24/26 Patient was discharged.

Diagnosis: Adnexitis with pelvic peritonitis.

Readmitted eight days later with persistent vaginal bleeding and pain in the right lower quadrant. A cystic mass was still felt in the right adnexal region.

3/24/26 Blood bilirubin (VDB) 0.33 mg.

3/25/26 At operation, there was a right tubal abortion with a moderate amount of dark blood in the pelvis.

CASE 5.—Admitted 3/23/26. Patient had experienced pain in the left lower quadrant for a month. It was mild until three days before admission when she was seized with severe abdominal cramps and fainted. On the day of admission, the griping pains returned. Examination revealed on the left side of the pelvis a very tender, semicystic tumor.

3/25/26 Blood bilirubin (VDB) 0.5 mg.; later 0.7 mg.

3/25/26 11:30 P.M. sudden agonizing abdominal pain, followed by marked weakness.

3/25/26 At operation, there was found a left tubal pregnancy with hemorrhage into the tube, extending through its abdominal ostium into the pelvis where there was about a pint of free and clotted blood.

CASE 6.—Admitted 6/30/26. Last menstrual period started 5/28/26. Two weeks later, the patient noticed spotting and lower abdominal pain, more on the left side. The pain became severe on the night preceding admission. Examination revealed a boggy left adnexal mass.

7/1/26 Blood bilirubin (VDB) 0.68 mg.; icterus index 1.4 mg.

7/1/26 Operation. There were many blood clots in the lower abdomen. The left tube was pregnant, with a rupture on the posterior wall.

CASE 7.—History given previously. Cystorectocele with palpable ovarian mass.

Blood bilirubin (VDB) 1.6 mg. Direct (VDB) faintly positive. Icterus index 2.3 mg.

CASE 8.—Admitted 8/8/26. Patient had her last menstrual period five weeks before admission. She had abdominal cramps for a week, first localizing in the left lower quadrant of the abdomen on the day of admission. She was admitted in shock.

8/8/26 Blood bilirubin (VDB) 0.25 mg. Icterus index 1.7 (slight hemolysis).

8/8/26 At operation much free blood, with large clots, was found in the abdomen. There was a rupture of the left tube near its distal end. A fetus of two months' size lay free.

Case 9.—Admitted 8/27/26. Since June, the patient had been menstruating irregularly, and complained of abdominal discomfort. She thought she was pregnant until July 27 when she had labor pains and a hemorrhage. Nine days later bleeding started again. After an interval of eleven days, a feeling of pelvic pressure was experienced which became actually painful two days before admission. On examination, patient looked anemic and sick. There was a soft cystic, slightly tender mass behind and to the left of the uterus.

8/28/26 Blood bilirubin (VDB) 0.45 mg.; icterus index 0.9 mg.

8/28/26 At operation, much free blood was found in the abdomen, and a ruptured left tubal pregnancy.

Case 10.—Admitted 9/15/26. The last normal menstrual period started July 3. On August 4, when five days overdue, patient felt pain in the left lower quadrant of the abdomen. On August 27, pain was again experienced and patient began to bleed. Pain and bleeding persisted for the eighteen days preceding admission. On examination, there were signs of peritoneal irritation in the left lower quadrant *and a tender boggy mass in the left adnexal region.*

9/15/26 Blood bilirubin (VDB) 0.63 mg.; icterus index 1.45 mg.

9/15/26 At operation *no* free blood was found in the abdomen. The left tube was the seat of a pregnancy the size of a fist.

Case 11.—Readmitted 9/28/26. *Interval Note:* Discharged two weeks previously, the patient still had cramps in the right lower quadrant of the abdomen, and vaginal bleeding. She had lost much blood and felt very weak. Examination revealed a right adnexal mass the size of a hen's egg.

10/2/26 Blood bilirubin (VDB) 0.95 mg.

10/2/26 At operation, there was *no* free blood in the peritoneal cavity. The right tube was irregularly enlarged, blue, and contained old blood clots.

Case 12.—Admitted 10/8/26. Patient's last regular period started August 17. On September 14 when the next period was expected, she spotted a little. She took pills to cause bleeding and bled profusely the next day. Two days later there was a severe hemorrhage, and the patient felt dizzy on attempting to get out of bed. Irregular bleeding persisted with cramp-like pains in the lower abdomen, more on the left side. There was some fever and pain in the right shoulder. Patient fainted three times before admission. On examination, there was a tender cystic mass in the right adnexal region extending up almost to the iliac crest. Icterus index, 0.9 mg.

10/9/26 Blood bilirubin (VDB) 0.25 mg.

10/9/26 At operation, much dark, tarry blood was found in the pelvis. There had been a right tubal abortion.

Case 13.—Admitted 11/4/26. Patient had never been gravid, though married fifteen years. Many years ago, she was twice operated upon for "abdominal inflammation." Her last regular menstrual period started September 1. She missed the October period, then ten days later she was seized with severe lower abdominal pain, vomited, and began to bleed vaginally. She fainted on trying to get out of bed on the second day after the onset of the pain. Metrorrhagia continued to the time of admission. On examination, she showed moderate pallor. There was a tender irregular doughy mass on the right side of the pelvis, and the left adnexa were thickened.

11/25/26 Blood bilirubin (VDB) 0.6 mg.

11/25/26 Operation. The abdomen was full of blood. The right tube had tube was thickened and adherent.

Case 14.—Readmitted, 11/25/26. Patient had been in the ward a week previously, with abdominal pain and irregular bleeding; considered to be an inflammatory case. On the day of readmission, she had been examined by her doctor, following which she experienced severe lower abdominal pain, and fainted. Pain, weakness and "spotting" continued. On admission, she was very pale, with rapid pulse and tender distended abdomen.

11/25/27 Blood bilirubin (VDB) 0.6 mg.

11/25/27 Operation. The abdomen was full of blood. The right tube had ruptured and was bleeding freely in its isthmic portion. A two and a half month's fetus lay free in the abdominal cavity.

CASE 15.—Admitted 1/27/27. Patient had been anemic for many years. She had no children, but had had two abortions, the last one seven years ago. She had been bleeding irregularly since her November period. Twenty-four hours before admission to the hospital, she began to have severe abdominal pain and felt faint. She was found to be acutely ill; she was pale, with icteric tint of the skin. There was marked tenderness, and a sense of resistance in the left vaginal fornix, and a soft bulge of the culdesac.

1/27/27 Blood bilirubin (VDB) 0.25 mg.; icteric index, 0.7 mg.

1/27/27 At operation, 600 to 800 c.c. of free blood were found, together with a large quantity of clots. There was an hematocele of the left tube, with a rupture at the fimbriated end. The right tube was also the seat of an hematocele.

CONTROL CASES WITH HIGH BILIRUBIN VALUES

Y. S.—VDB. 0.67 mg.—Incomplete abortion.

J. W.—VDB. 0.63 mg.—Prolapse. Plastic operation and ventrofixation were done. The pelvic organs were atrophic.

A. H.—VDB. 0.75 mg.—Prolapse. Laparotomy revealed normal tubes and ovaries.

S. N.—VDB. 0.87 mg.—History given previously. Pregnancy with ovarian and parovarian cysts (operated upon as a suspected ectopic).

D. M.—VDB. 0.8 mg.—"G" adnexitis with pelvic peritonitis.

B. L.—VDB. 0.9 mg.—A case of prolapse. At operation, adnexa were found normal.

G. P.—VDB. 1.0 mg.—Cystocele. A plastic operation was done, but no laparotomy.

R. K.—VDB. 1.0 mg.—Adherent retroflexion with chronic salpingitis. (One tube removed, pathologic report "chronic salpingitis.")

N. P.—VDB. 1.1 mg.—Postabortive pelvic exudate with local peritonitis.

H. G.—VDB. 1.6 mg.—A case of "G" urethritis, endocervitis and salpingitis. Admitted with a temperature of 103.6° F. and signs of pelvic peritonitis. No operation. Symptoms subsided with rest in bed.

Follow-up note: Patient completely well.

Note: The blood bilirubin values of this, and of the following patient, were equal to the highest ectopic value.

L. C.—VDB. 1.6 mg.—Chief complaint was metrorrhagia for three months.

Icterus index—4.4 mg.—On examination, the uterus was slightly enlarged. Adnexa were negative. No jaundice visible. Curettage was done. *Pathologic report:* Endometrium with small areas of exudate.

REFERENCES

(1) *Virchow, R.:* Virchow's Arch. f. path. Anat., 1847, i, 379. (2) *Fischer, Hans, und Reindel, F.:* München. med. Wchnschr., 1922, lxix, 1451. (3) *Rich, A. R., and Bumstead, J. H.:* Bull. Johns Hopkins Hosp., 1925, xxxvi, 225. (4) *Froin, G.:* Gaz. d. hôp., 1906, lxxix, 75. (5) *Guillain, G., and Troisier, J.:* Rev. de méd., 1909, xxix, 469. (6) *Van den Bergh, A. H. H., and Snapper, J.:*

Berl. klin. Wchnschr., 1914, li, 1180. (7) *Van den Bergh, A. H. H., and Snapper, J.:* Berl. klin. Wchnschr., 1915, lii, 1082. (8) *Hoover, C. F., and Blankenhorn, M. A.:* Arch. Int. Med., 1916, xviii, 289. (9) *Hooper, C. W., and Whipple, G. H.:* Jour. Exper. Med., 1916, xxiii, 137. (10) *Leschke, Erich:* Deutsch. med. Wchnschr., 1921, xlvii, 377. (11) *Tarchanoff, J. F.:* Pflüger's Arch., 1874, ix, 53. (12) *Tarchanoff, J. F.:* Pflüger's Arch., 1874, ix, 329. (13) *Stadelmann, E.:* Arch. f. exper. Path. u. Pharmakol., 1882, xv, 337. (14) *Stadelmann, E.:* Der Icterus und seine Verschiedenen Formen. Stuttgart, 1891, p. 31. (15) *Rich, A. R.:* The formation of bile pigment. Physiol. Rev., 1925, v, 182. (16) *Dick, R.:* Arch. f. Gynäk., 1884, xxiii, 126. (17) *Schiller, W., and Ornstein, Fr.:* Ztschr. f. Geburtsh. u. Gynäk., 1925, lxxxix, 352. (18) *Lodewijks:* Zentralbl. f. Gynäk., 1909, xxxiii, 346. (19) *Schottmüller, H.:* München. med. Wchnschr., 1914, lxi, 230. (20) *Schumm, O.:* Ztschr. f. physiol. Chem., 1916, xcvii, 45. (21) *Norris, E. H.:* Surg., Gynec. and Obst., 1920, xxxi, 34. (22) *Bernheim, A. R.:* Jour. Am. Med. Assn., 1924, lxxxii, 291. (23) *Meulengracht, E.:* Deutsche. Arch. f. klin. Med., 1921, cxxxvii, 38. (24) *Maue, H. P.:* Surg., Gynec. and Obst., 1922, xxxiv, 752. (25) *Hawks, E. M.:* Surg. Clin. N. Amer., April, 1925, p. 297. (26) *Hess, A. F., and Myers, V. C.:* Jour. Am. Med. Assn., 1919, lxxiii, 1743. (27) *Van den Bergh, A. H. H.:* Der Gallenfarbstoff im Blute, Leiden, 1918. (28) *Lepehne, G.:* Deutsch. Arch. f. klin. Med., 1921, cxxxv, 79. (29) *Bang, F.:* Gynéc. et Obstet., 1926, xiv, 223. (30) *Feigl, J., und Querner, E.:* Ztschr. f. d. ges. exper. Med., 1919, ix, 153. (31) *Lepehne, G.:* Deutsch. Arch. f. klin. Med., 1920, cxxxii, 104. (32) *Thannhauser, J. S., and Andersen, E.:* Deutsch. Arch. f. klin. Med., 1921, cxxxvii, 181. (33) *Botzian, R.:* Mitt. a. d. Grenzgeb. d. Med. u. Chir., 1920, xxxii, 554. (34) *Mandelbaum, R.:* Monatschr. f. Geburtsh. u. Gynäk., 1922, lix, 17. (35) *Greene, C. H. et al:* Arch. Int. Med., 1925, xxxvi, 259. (36) *Förster, J., and Förstner, B.:* Ztschr. f. klin. Med., 1926, ciii, 703. (37) *Retzlaff, K.:* Ztschr. f. d. ges. exper. Med., 1923, xxxiv, 162.

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BACKACHE FROM AN OBSTETRIC AND GYNECOLOGIC STANDPOINT

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SO FREQUENTLY do patients consult the gynecologist or obstetrician for backache among other complaints as to make this subject interesting for investigation. Accordingly, all cases seen from October 1, 1924, to September 1, 1926, were tabulated. During this period 943 consecutive patients were seen. Of these 243 or 24.3 per cent complained of backache alone or in conjunction with other complaints, leaving 700 patients out of the total number of 943 who did not complain. Of these 285 (30.3 per cent) had never been pregnant, 24 (2.5 per cent) had had one or more miscarriages, but no full-term pregnancies, 345 (36.5 per cent) had had one or more babies, while 46 (4.9 per cent) pregnant at the time of examination were given supportive corsets and continued through the pregnancy and puerperium without difficulty. Of the 243 patients who complained of backache 42 (4.5 per cent) had never been pregnant, 163 (17.2 per cent) had had one or more babies, while 38 (3.1 per cent) were pregnant at the time the backache was first noticed.

The patients were next studied in an attempt to analyze the etiology of the backache. They were tabulated according to the provisional diagnosis made at the time of entrance.

The most frequent cause of backache was found to be retroversion. Poor posture and general atonicity with loss of weight if grouped together formed the next largest group and pelvic relaxation the third. When these cases, however, were studied from the standpoint of the relief of the backache, obtained through treatment of the pathology originally diagnosed, it was found that, in many instances, the backache was not relieved, although the originally diagnosed pathologic condition was corrected. That is, the diagnosis so far as the etiology of the backache was concerned had been in error.

A more detailed study of the treatment and results of each of these various abnormal conditions follow:

1. *Retroversion.*—There were 50 cases or 24.4 per cent. Of these, 35 carried out the treatment advised. Twenty-one of the 35 patients were either cured or greatly improved. That is, in 60 per cent of the cases of retroversion, the pelvic pathology was wholly or in great part responsible for the backache. In 14 cases, or 40 per cent, however, correction of the retroversion had no effect on the backache. From this it would seem that the diagnosis of the pelvic pathology as the cause of backache in these cases was incorrect. These 14 cases were studied further and it was found that upon giving them supportive abdominal corsets and abdominal exercises, eleven were cured or greatly relieved of backache. These eleven cases should therefore be included under the classification of poor posture rather than under that of retroversion.

Because retroversion may so often exist without causing trouble, the rule has been adopted of proving such retroversion the true etiologic factor of various complaints, before advising operative procedure. This may easily be done in the majority of cases by correcting the retroversion temporarily with a pessary. If following such a procedure the patient's complaints disappear, only to recur upon removal of the pessary and return of the retrodisplacement, one may assume that the retroversion is the source of the trouble and operation may be advised with fair assurance of a good postoperative prognosis.

2. *Pelvic Relaxation.*—Under this head were included all patients having cystocele, rectocele, or prolapse, or a combination of one or more of these conditions. In all there were 38 cases, or 13.8 per cent which seemed to belong in this class.

Sixteen, or 84 per cent, of patients who followed the advice given were greatly improved so far as the backache was concerned. It is, however, interesting to note that in two cases out of three where corsets and pessaries were employed the results were poor. This may be explained by the fact that if the intraabdominal tension is increased by abdominal supports and exercises in cases having pelvic relaxation, the latter conditions will almost invariably be augmented and give rise to increased trouble. Therefore, in cases of poor posture combined with pelvic relaxation, the pelvic support should first be restored so as to prevent accentuation of the pelvic relaxation by supportive abdominal regiem. In one case where operation failed to cure the backache the patient was subsequently given a corset with relief of symptoms. In the three cases relieved by corsets, the pelvic relaxation was very slight. These four latter cases should therefore be classed as poor posture.

3. *Fibroid Tumors of Uterus.*—Under this classification there were 19 cases or 9.3 per cent. There were nine patients who followed the advice given and had the tumors removed by either myomectomy or hysterectomy. In each instance the backache was cured. The ten patients who did not follow the advice given, did not return and are therefore not available for study. These results seem somewhat surprising as it is difficult to see how a fibroid tumor per se unless

of enormous size could cause backache. None of the tumors included in this series could be termed enormous, the largest being about the size of a large grapefruit. The fact remains, however, that in each case the backache was eradicated upon removal of the tumor. The latter must therefore be considered as the cause of the backache.

4. *Bilateral Cervical Laceration with Erosion and Endocervicitis.*—Under this head fell 16 cases or 7.8 per cent. Ten of the twelve cases (80 per cent) treated by cautery, were practically cured of the backache. The exact method by which cervical erosion may cause backache is also somewhat obscure. In these cases the anterior sacroiliac ligaments are often extremely tender to vaginal examination. It is possible that a low grade infection is carried backward to the sacroiliac joints by the lymphatics of the sacrouterine ligaments. In both of the two failures of this series subsequent relief was obtained by the use of abdominal exercises and supportive corsets, thus placing these two cases under the classification of poor posture.

5. *Pelvic Inflammation* was noted in 13 cases or 6.3 per cent. Of the six patients following the advice given, there were two cures, two improvements and two failures. The two cases tabulated as "improved" are placed in that class because they have been under observation only a short time. Eventually they will probably go under the heading of "cured," as to date they have been relieved of the backache. In the two cases recorded as "failures" it is felt that the conservative treatment will have to be substituted by operative procedure, in which event it is hoped that the backache will be relieved.

6. *Pelvic Relaxation and Retroversion* was found in eleven cases or 5.3 per cent. Six patients followed the treatment advised. Of this number there were two cures, one improvement and three failures. The one case not relieved of backache following repair of the pelvic condition was subsequently aided by a corset and abdominal exercises. This means it should be placed under the heading of poor posture. There were three cases where the retroversion was relieved by pessary and the patients given corsets without repair of the pelvic relaxation. Two of these three cases failed to be relieved of backache. This again brings out the necessity of obtaining adequate pelvic support before increasing the intraabdominal pressure.

7. *Miscellaneous Causes.*—Under this head were included three cases of sacroiliac arthritis, three cases of back injury, two cases of pyelitis, one tubal pregnancy, and one case of bilateral chocolate cyst of the ovaries.

(a) *Sacroiliac Arthritis.*—Here there were three cases, or 1.5 per cent. The two patients who followed the advice given, that is removal of the septic focus of infection, were relieved of the backache.

(b) *Back Injury.*—There were three cases of back injury or 1.5 per cent. Two of these patients were referred to orthopedic surgeons, who obtained relief of the backache by the use of proper back support. The third, a very mild affair, was relieved by merely relacing her corset.

(c) *Pyelitis.*—Two cases of pyelitis or 0.8 per cent were relieved of the backache upon the clearing up of the pyelitis by medical treatment.

(d) *Tubal Pregnancy.*—One case of tubal pregnancy (0.4 per cent) complained of backache which was relieved following operation and correction of the pelvic pathology.

(e) *Bilateral Chocolate Cyst of the Ovaries.*—There was one case of this type; the backache disappeared following operation and removal of the cysts.

8. *Poor Posture and General Atonicity.*—These two groups have been classed together because it is felt that in reality they are merely different manifestations of the same process. Under the former heading there were 37 cases or 18.1 per cent while under the latter there were 11 cases or 5.3 per cent.

(a) *General Atonicity.*—Under this head there were eleven patients. Seven of these were relieved by general hygenic measures such as increased weight, forced feedings, definite rest periods and gradually increasing outdoor exercise. Three patients refused the treatment advised while in one the treatment has not as yet been carried out over a sufficient length of time to warrant any definite statement as to the final outcome.

(b) *Poor Posture.*—Here there were 37 cases or 18.1 per cent. Improvement of the backache was obtained in 27 out of 28 patients who faithfully followed the treatment advised. In one case the treatment failed to relieve the backache.

From the preceding groups, however, there were in all 19 patients in whom, by subsequent study and treatment, the cause of the backache proved to be due to poor posture. It becomes necessary, therefore, to revise the first ascribed etiology of backache in this series. In a revised classification only those patients have been included who followed out treatment, and they have been placed in the group to which they belong so far as the backache is concerned.

Apparently poor posture proved to be the cause of backache more than twice as often as any other one cause and over one-third of all cases (37.9 per cent) could be attributed to this etiology. By posture is meant the relation of the various parts of the body to each other. Goldthwaite in the Shattuck Lecture for 1925 states that the body is in good or normal posture when "all of the structures are in such adjustment that there is no particular strain on any part." In this position the body is made as tall as possible without rising on the toes. The head is erect, the chest expanded, and the diaphragm raised. The abdominal wall is rounded above and firm and flat below so that the abdominal cavity assumes the shape of an inverted pear. By this means the abdominal contents are held well up in place without causing undue strain on their mesenteric attachments. Again with the body in this posture most of the breathing is done with the diaphragmatic muscles. There occurs with each inspiration and expiration a change in intraabdominal pressure, which is a marked aid in the maintenance of the abdominal circulation, the emptying of the inferior vena cava and the return of venous blood from the lower extremities and abdomen.

As the individual begins to assume poor posture the body is thrown out of its normal relationship, the head droops forward, the chest becomes flat, the diaphragm is carried low so that most of the breathing is done by the intercostal muscles. Thus the normal rhythmic change in intraabdominal pressure is impaired, resulting in a loss of the maximum abdominal circulation. There would result, theoretically at least, a general passive congestion of the abdominal and pelvic organs. The upper abdomen becomes flat while the lower abdomen becomes rounded and ptotic. The abdominal viscera become ptotic with undue strain on their mesenteric attachments. Again as a relaxed posture is assumed, the dorsal and lumbar curves become increased with undue tension on the intraspinous ligaments. The pelvic inclination is exaggerated with sacroiliac and lumbosacral pain and backache.

Thus it can be seen why poor posture may be one of the important causes of backache. If it is to be guarded against, however, the etiology of the poor posture must be sought and corrected. Some of the more important etiologic factors leading to this condition are: (1) Improper habits; (2) general muscular debility; (3) the heavy ptotic abdomen; (4) improper footwear; (5) pregnancy.

The first of these needs no elaboration. It can be easily seen that a person with perfect posture, if she allows herself to become stooped while doing her daily work will soon acquire the habit of poor posture and become unable to use her body properly. Examples of the second type, that of general muscular atonicity, are so common that they are met with each day in the general run of practice. These patients are the thin anemic type who become tired out on the least exertion. They have neither the physical energy to hold themselves in proper posture nor the mental energy to develop this physical stamina. They are the type of patients who go from operation to operation, relieved for a short time, only to return soon with some new complaint or a recurrence of the old.

The heavy type of individual with a fat ptotic abdomen usually does not develop poor posture until late in life. Here the loss of posture is due to the forward pull of the heavy ptotic abdomen. The center of gravity is thus thrown forward and there results an increase lordosis to maintain the equilibrium. Thus the lumbosacral and sacroiliac ligaments are put under undue strain with resulting backache.

In the younger type of individuals, especially the young girls, footwear often plays an important part in developing poor posture. In this instance the French heels throw the center of gravity forward. To maintain the balance the individual assumes a position of increased lordosis, with resulting back and joint strain.

Finally, pregnancy is an extremely frequent cause of abnormal postural development. During pregnancy there is a gradual increase in the size of the abdomen. The center of gravity is thrown forward and again there occurs a compensatory lordosis to maintain the equilibrium. As the uterus increases in size, the abdominal muscles become extremely stretched and thinned out. With the advent of labor the intraabdominal contents are suddenly reduced. The abdominal wall at times, however, regains its tone extremely slowly. When after ten to fourteen days the patient assumes the upright posture, the abdominal wall is still relaxed, thus allowing the abdominal contents to prolapse into the lower abdomen. The upper abdomen becomes flat; the chest begins to droop; and the beginning stages of poor posture are well established.

If the above be true, it would naturally follow that backache, the symptom of poor posture with which this paper deals, should be found more frequently among women who have borne children than among nulliparous women. Of the 943 cases here recorded, 327 were nulliparae while 616 had borne children. There were 42 cases of backache among the nulliparae, or 12.8 per cent, while among the multiparous patients there were 201 cases of backache or 32.6 per cent.

In this series, at least, backache was 2.5 times as frequent among multiparous as among nulliparous women.

Also if pregnancy plays an important rôle in the development of poor posture, it might be expected that the onset of the backache would often be attributed by the patient to a previous pregnancy. In analyzing the time of onset of the 201 cases of backache in multiparae it was found that 58 or 28.8 per cent came on immediately following pregnancy, while 38 or 18.4 per cent came on during pregnancy. In 105 cases the backache was not related to pregnancy by the patient. That is in 96 cases or 46.2 per cent the backache was definitely related to pregnancy by the patient.

Still further proof of the contention that pregnancy is one of the precursors of poor posture is found in the treatment and results obtained on the 38 cases in this series where backache came on during pregnancy. Thirty-three of these were given maternity corsets, which were, at regular intervals, fitted so as to give the enlarging abdomen proper support. Of these the backache was completely relieved in eight cases, markedly improved in 20 cases, while in five cases there was very little relief. The remaining five cases were advised to get maternity corsets, but never returned to the office so no follow-up record is obtainable. Twenty-two of the 33 cases treated above were given corsets and abdominal exercises postpartum. Nineteen of these 22 had no return of backache while in three cases the backache returned and was not relieved until the uterus was restored to position by a pessary. There were, however, several cases in this group who had postpartum retroversion without any complaints. On the other hand, of the eleven cases where corset and exercises were not given postpartum, six or over 50 per cent complained of varying amounts of backache following the puerperium. The backache in one of these six was cured by the use of a pessary. Relief in the others, however, despite the fact that two of the five had postpartum retroversions, was not obtained until the relaxed abdomen was given proper support.

SUMMARY

It is realized that the number of cases here reported is too small to warrant any definite conclusions. The results would seem to indicate, however, that backache is a common symptom among women consulting the gynecologist and obstetrician, being present in 243 or 24.3 per cent of the cases in this series. Study of these cases would show that while abnormal pelvic conditions can be, and often are, the cause of the backache, there still remain many cases where correction of the pathology has little or no effect upon the backache. Such cases, if studied from a postural standpoint will often show abnormal posture. Correction of this condition leads to a good prognosis so far as the relief of backache is concerned. In the present series posture was shown to be the underlying cause of backache in 37 per cent of cases while the next most frequent cause was retroversion with only 15 per cent of cases. Again it would seem that poor posture is often a result of the overstretching of the abdominal wall during pregnancy. Finally, such damage can in many cases, be reduced or prevented, by proper support and reconstructive exercises.

511 MAYER BUILDING.

UTERUS DIDELPHYS*

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CASES of fully developed uterus didelphys, or double uterus, are quite rare. Therefore the following case appears worthy of record.

Patient was thirty-eight years of age; housewife and waitress. She complained of pain in the left lower quadrant and left leg.

She was married at the age of fourteen, had three pregnancies, and one miscarriage at six months, induced.

Fourteen years previously, the patient suffered with considerable pain on the right side of the abdomen. A right salpingectomy, appendectomy, and myomectomy were performed at that time. She remained well until five years ago when she began having pain in the left side four or five days before catamenia set in, and five days afterwards. This condition gradually became exaggerated, the pains being so severe that the patient was unable to sleep nights. Treatment was not of any avail. The pain was not related to food, but definitely to periods. At times she was bothered with flatulence, belching, and sour taste. She was never nauseated, and had no dizzy spells and no icterus.

The uterus was anteflexed, small, and drawn to left. There was marked tenderness in the left fornix. Tube and ovary were palpated in a mass connected to the left side of the uterus. There were bilateral cervical orifices with a septum between.

Operation, Oct. 21, 1926, by Dr. C. G. Levison. An old low midabdominal scar was incised. Fascia were incised from pubis to navel, and the muscles were infiltrated with 0.5 per cent novocaine, after which the peritoneum was opened. A large wide band of omental adhesions was attached to the parietal peritoneum as well as to the fundus of the uterus and was partially covered with bladder anteriorly. Inspection of the pelvis showed that the fundus of the uterus was partially covered with bladder anteriorly. Attached to the left cornu appeared to be sigmoid, plus omental, adhesions. This mass was carefully dissected from the uterus. There was a marked left oophoritis and salpingitis. A small, soft diverticulum of the sigmoid with three small nodules adjoining it was found. This was not disturbed. A supravaginal hysterectomy was performed, using the reflected peritoneum from the bladder for peritonealization. There was an anomalous structure like a severed ureter at its distal end. It was traced up toward the pelvis of the left kidney. On further dissection, this did not resemble a ureter, but a fibrous band of adhesions. A mass the size of a lemon was found retroperitoneally on the right side of the pelvis. After examination, it was found that this extended down apparently to the right cervix, so that we were dealing with the right fundus of a double uterus. The fallopian tube on this side was removed at the former operation. The ovary was buried in adhesions and as there was no apparent pathologic condition here, the operation was terminated after the sigmoid was placed in the pelvis, and the omentum was placed advantageously in the abdomen. The abdomen was closed in the usual manner, using plain No. 2 catgut for continuous sutures for the peritoneum, muscle, and fascia. Several interrupted linen sutures reinforced the fascial layer. The skin was closed with interrupted silk sutures. Patient left the table in excellent condition.

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*From the Surgical Service of Dr. Charles G. Levison, Mount Zion Hospital.

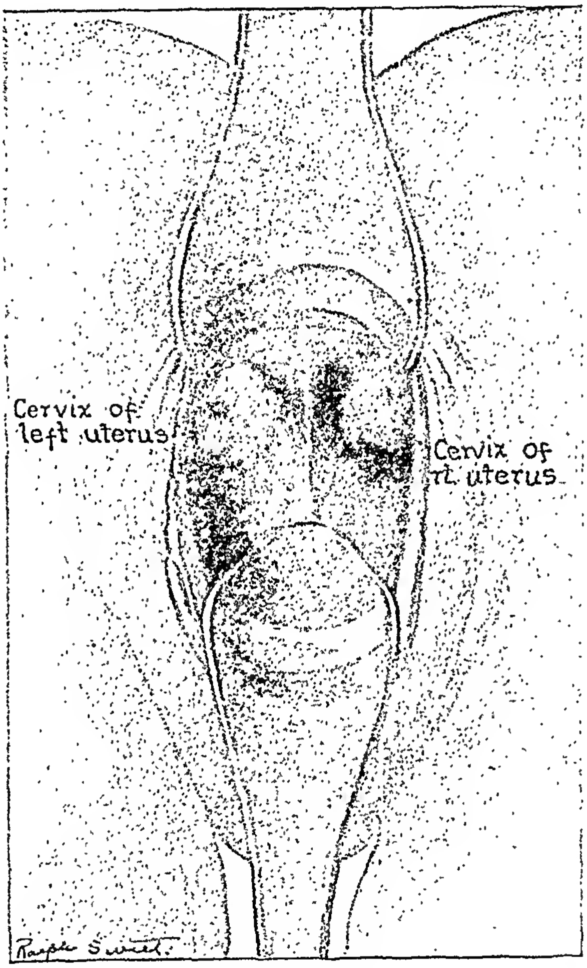

Fig. 1.—View of bilateral cervices and septum between.

Diagnosis: Double uterus. Left salpingitis and oophoritis. Fibroid uterus. Adhesions of omentum and sigmoid to the uterus.

The patient made an uneventful recovery. She is menstruating from the right uterus each month.

Cystoscopic examination Nov. 4, 1926, by Dr. L. C. Jacobs. Bladder wall and mucosa were normal. Ureteral orifices were negative and catheters were inserted easily on both sides reaching the pelvis of both kidneys. Indigo carmine was injected intravenously and appeared at both ureteral orifices in less than five minutes. Urine was negative. A cystogram showed a bladder diverticulum on the right. Both ureters were intact, and both kidneys were functioning.

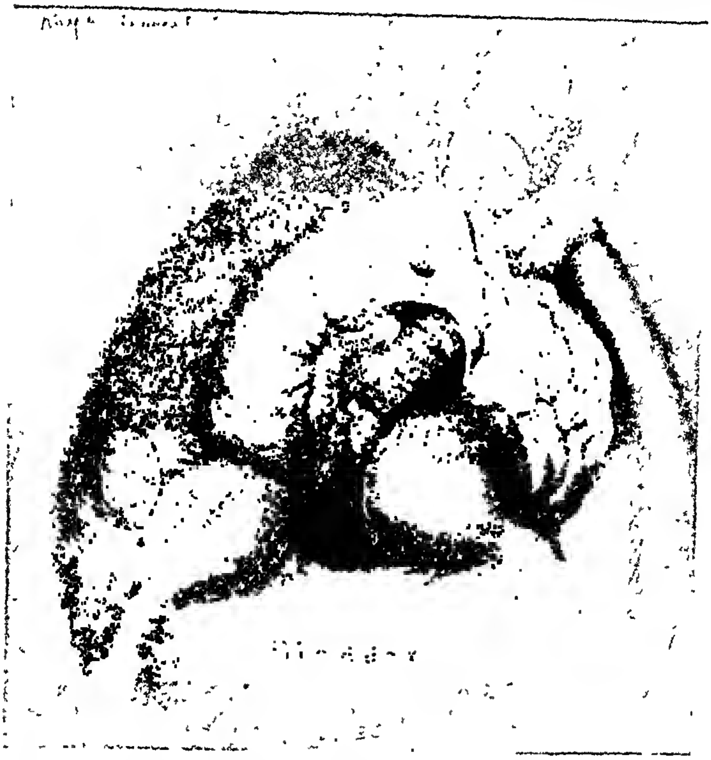

Fig 2.—View of pelvis looking in through the open abdominal wound. The left uterus with the tube, ovary, and adhesions to the sigmoid are clearly seen inbedded in one mass. The right uterus is seen in position retroperitoneal. The right ovary is outlined and was in a mass of adhesions caused by the former right salpingectomy. The bladder may be seen with a small diverticulum near the right uterus and round ligament.

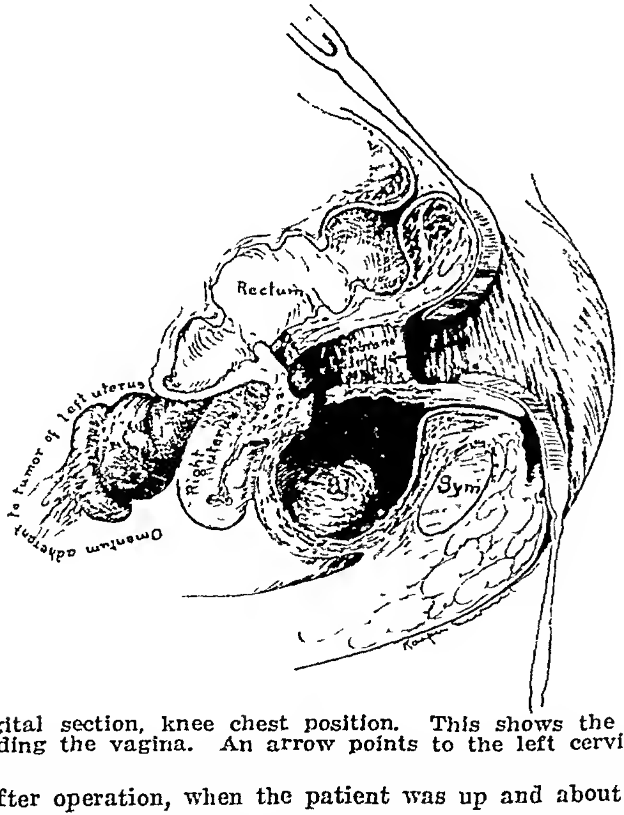

Fig. 3.—Parasaggital section, knee chest position. This shows the long membrane dividing the vagina. An arrow points to the left cervix.

Three weeks after operation, when the patient was up and about the hospital, a further study of the abnormality was made. An x-ray picture, after lipiodine injection, showed the oil in the right uterine cavity and cervical canal. No right tube was discernible. The left cervical os was obliterated completely by the use of the electric cautery at the operation.

2200 Post Street.

SPINAL ANESTHESIA IN OBSTETRICS*

By S. A. Cosgrove, M.D., F.A.C.S., Jersey City, N. J.

"For we know that every creature * * * travaileth in pain * *." Thus the ancient world accepted the inevitability of pain in labor. Modern obstetricians rebel against this inevitable relation, and have acquired a considerable armamentarium with which to combat it. These resources embrace a variety of agents and methods sufficient to afford considerable flexibility in meeting with varying conditions. But it must be admitted that no single agent, or method, or combination thereof, is at the present time adequate to completely divorce the function of parturition from suffering. Investigation, therefore, of the possibility of any method not included among those commonly in use, may contribute to this desirable end.

A method which would block the pelvic sensory supply without affecting the motor activity of the uterus too greatly, would be ideal. At first thought, it would appear that some form of regional anesthesia might offer this combination. But more intimate study of the matter is not encouraging.

Regional anesthesia, of whatever type, to be of general obstetric usefulness, must anesthetize the lower abdominal parietes, perineum, external genitalia, pelvic peritoneum and pelvic viscera.

1. *Infiltration anesthesia* is obviously too restricted in its area of effectiveness, although it has a definitely valuable place in abdominal hysterotomy in selected cases where the cooperation of the patient can be depended upon.
2. *Regional block,* extrinsic to the spinal column, of the entire nerve supply of the parts indicated is technically more or less tedious and difficult, and a decided tax on the patient.
3. *Caudal infiltration* of the terminal filaments of the cord extrinsic to the spinal sac is occasionally difficult, the onset of the anesthesia is slow and the area affected is less extensive than that indicated as desirable. Both of these methods are not uniformly of satisfactory efficiency.
4. *Spinal block,* whereby the spinal roots themselves are bathed by the anesthetic solution at their exit from the cord within the dura, is the only one which is simple in technic, practically unfailing in effectiveness and sufficiently wide in its area of anesthesia. But certain systemic dangers are potentially inherent in it.

Finally, all of these procedures are so transitory in the duration of their effect as to sharply limit their obstetric usefulness.

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*Read by invitation at a meeting of the New York Obstetrical Society, March 8, 1927.

Yet considerations more or less peculiar to obstetrics impel the most careful scrutiny of the possibilities of anesthetic methods other than inhalation narcosis. These considerations have to do with the treatment of pregnancy toxemias. At the risk of entering upon dangerously controversial ground, brief allusion must be made to them.

There is general agreement that the pathogenetic basis for eclampsia and the lesser toxemias identical in their pathogenesis with it, is unknown. All that is certainly known is that they occur in conjunction with, or shortly following, and depend upon the presence of a conception product in the uterus. Their treatment has always depended upon four indications: (a) prophylaxis; (b) removal of the gestation product; (c) acceleration of general eliminative processes, and (d) alleviation of symptoms.

As to the importance and means of prophylaxis there is general agreement. Also there is substantial subscription to the necessity, when less active prophylactic measures fail, for the removal of the gestation product by more or less radical procedures, as a part of the scheme of prophylaxis. The importance of this measure is countenanced in those toxic cases which are eclamptic in all but the actual occurrence of convulsions. This termination of pregnancy is the only measure at our command which is in any sense directed toward the etiology or pathogenesis of the disease.

The removal of the gestation product in the actual treatment of eclampsia after the onset of convulsions was generally practiced up to less than two decades ago. The means frequently used, however, entailed excessive trauma, shock, and factors of increased toxemia So, under the leadership of Stroganoff, there began a revulsion against this practice and that revulsion is still in full swing. A majority of the most eminent authorities and a most formidable mass of statistics attest that the eclamptic has a greater chance of recovery if the conception product is ignored and all attention concentrated on elimination and symptomatic treatment.

This presents a paradox. A preeclamptic patient is accorded the benefit of removal of the gestation product, the most direct attack on the cause of her illness. The same patient, in the same hands, is denied this benefit the moment she becomes sick enough to have a convulsion. The baby is permitted a chance for life and health if convulsions threaten. It is condemned to run the slim chance of surviving its mother's toxemia if convulsions actually supervene.

The reason for this undoubted paradox is said to be that with the onset of convulsions there is superadded to the patient's condition an increased susceptibility to shock and a heightened acidosis which gravely increase the risk of interference which, to be prompt enough to be of value, must in many cases be operative.

This we concede. But we have nevertheless believed for many years that the best treatment for eclampsia, as is conceded by others for preeclamptic conditions resistant to other treatment, includes the removal of the gestation product at a time as early, and by means of such nature; as will not in any detail increase the danger to the mother.

This is not the occasion for the statement of extended evidence in support of this contention. We do believe that our own experience supports it. DeLee is conforming more and more to it in his practice. Private advices are to the effect that many of the large Continental clinics are tending at present to greater radicalism. Stander, of Johns Hopkins, recently indicated a partial leaning of opinion toward it. Even very conservative observers include acceleration of the termination of labor in their programs; this, no doubt, to minimize the shock of prolonged labor, but, we suspect, not without a decided sense of satisfaction that the conception product is out, nor a lively appreciation of the enhancement of the prognosis thereby.

The real difficulty of the situation is in finding the means to terminate the gestation soon enough to be of benefit, without adding to the maternal jeopardy. We believe that the use of inhalation narcosis is incompatible with the solution of this problem.

Thus at nearly every point it specifically augments the disorders characteristically observed in eclampsia and tends to increase fetal asphyxia, which is especially undesirable when superadded to a similar tendency present as a result of the maternal toxemia of eclampsia.

Spinal anesthesia, on the other hand, decreases arterial tension, thus attaining the exact symptomatic effect aimed at by many details of the accepted treatment of eclampsia. It lowers intracranial and intraspinal pressure as a secondary effect of its lowering blood pressure and lowers intraspinal pressure directly by the evacuation of the spinal fluid, as spinal puncture has been deliberately used for this purpose. Spinal anesthesia has no effect on the liver and kidneys and by lowering blood pressure and slowing the heart rate relieves the overstrained myocardium. It has no deleterious action on the respiratory tract, does not intoxicate the central neurons, protects the central neurons from noxious shock influences by complete blocking of the peripheral neurons. Spinal anesthesia lessens extent of convulsive involvement by the same blocking. It does not cause cyanosis and has no deleterious effect on the fetus.

Theoretically, therefore, spinal anesthesia would appear to be ideal for employment in any operative procedure undertaken in preeclampsia or eclampsia and hence to have a legitimate and important place in obstetrics.

In order to determine whether its practical application bears out its theoretic desirability we must consider (1) the advantages claimed for it, (2) the dangers urged against it, (3) the extent of general experience with its use in general surgery and in obstetrics, and (4) personal experience with it.

1. *The advantages* claimed for it by all observers familiar with its use are those already enumerated; besides, there is perfect analgesia, absolute muscular relaxation of parietes and viscera, stimulation of intestinal peristalsis, no toxicity due to absorption of drug, freedom from postoperative nausea, shock, ileus, lessened bleeding during operation, and immediate postoperative ability to ingest nutriment.

2. *The dangers* urged against spinal anesthesia are vasomotor, cardiac, and respiratory paralysis; nausea and vomiting during operation; paralysis of abducens, sphincter ani, nerves of extremities; bad psychic reaction of patients, both to the administration and to the operative procedure carried out while they are conscious.

This is a formidable indictment. But the many earnest workers most familiar with the method insist that most of these either do not occur in experienced hands, or can be obviated or controlled by refinement of technic and choice of cases for its use. Fatalities or dangerous reactions occur, according to these observers, only from grossly careless choice of risks.

3. *The extent of the general use* of spinal anesthesia is hard to estimate. First used almost forty years ago, and especially refined in technic during the last two decades, there have been in every principal country a few faithful exponents of the method. From their clinics come reports of large series of cases. In addition, many other operators have used or are using it, not all of whose material has been reported. It would appear from many references that its use is increasing with better understanding of it and closer discrimination as to its indications.

The obstetric use of spinal anesthesia does not appear to be as widespread as its use in surgery. A few recent reports have been made of it. A large number of obstetric operations are included in several large series published by various surgeons, without special discussion from the obstetric viewpoint.

In order to determine the extent of its obstetric use in this country, I recently addressed letters to one hundred and thirty-four American and Canadian special and general hospitals having obstetric services. Of these, ninety-three replied. Of the ninety-three, fifty-five sent a categorical negative as to its present or past use; thirty-eight qualified their answers as follows:

(1) Fifteen were satisfied with other methods, including ether, nitrous oxide, "twilight sleep," rectal anesthesia, ethylene, infiltration. It is evident from several of these that there is not a clear understanding that spinal anesthesia is unsuitable, and cannot replace other methods, for the production of first stage analgesia.

(2) Three expressed definite disapproval, distrust, fear, or dissatisfaction after some experience with it; one of these stated that it had been satisfactory, but they were evidently fearful of it; another will be referred to later.

Twelve without experience similarly expressed themselves.

(3) Five refer to use of sacral or caudal anesthesia; one, unsatisfactory; one, satisfactory in 80 per cent of cases; one, apparently abandoned; one, experimenting at present.

(4) One refers to use of regional block.

(5) One proposes to institute its use.

(6) Three refer to general adverse sentiment in community, presumably on the part of surgeons, with or without experience.

(7) Four are using it; one very rarely; one (J. Whitridge Williams) began a few months ago, has too small an experience to justify authoritative conclusions; two will be referred to later.

(8) One refers to satisfactory surgical use.

(9) Two were interested, but had no experience.

The two most complete answers reflect opposite experience and conclusions. Dr. P. Brooke Bland, of Philadelphia, says:

"1. The method is used occasionally. We regard it too dangerous for ordinary use.

"2. It is the most satisfactory as regards relaxation in abdominal work.

"3. We use stovaine ampules or Babcock's solution and, also, 1 per cent novocaine. It is injected in the left side of the spinal column on the level of the crest of the ilium. We were using it a great deal more ten years ago than we are today. Its use, therefore, is decreasing, not increasing. It was employed largely in cesarean section, especially in pregnant women with toxemia. It has been abandoned largely because we have had more deaths from its use than from any other anesthetic we have ever used."

Dr. R. Elsie Arbuthnot, of Los Angeles, says:

"1. Spinal anesthesia is used in the obstetric department.

"2. (a) It is satisfactory. Its use is increasing.

(b) The dose varies from 100 to 150 mg. of novocaine (Metz). The injection is made between the third and fourth lumbar vertebrae. The amount of fluid withdrawn to dissolve the novocaine varies from 4 to 7 c.c. If the delivery is to be by the vaginal route only 100 mg. of novocaine are used and not over 4 c.c. of fluid are withdrawn. If the delivery is to be by Cesarean section the dose varies from 120 to 150 mg. and 7 c.c. of fluid are withdrawn.

"(c) It is used in patients having pulmonary tuberculosis, serious heart lesions, and pneumonia."

Thus there are only four of eighty-six representative services using spinal anesthesia in obstetrics, certainly a poor showing for a method which has a rather wide surgical recognition as definitely advantageous in certain types of poor anesthetic risks.

4. *Personal experience.* In undertaking the use of the method upon which our own as yet small experience is based, we found a number of differences in technical detail advised. The discomforts and dangers sometimes attending its use are directly related to several factors, including the minute details of technic. By considering each of these factors, we have hoped to obtain a composite technic which would give the widest possible margin of safety.

(1) *The Age and General Condition of the Patient.*—In general, obstetric patients are relatively young and sthenic; even so, there must be careful individualization; arterial hypotension is a positive contraindication; in our practice we have placed the safe systolic minimum at 110 mm. Hg.

(2) *Agent Used.*—We have selected novocaine because it is the least toxic of the several drugs available.

(3) *Amount Used.*—Our dosage has varied experimentally from 35 to 100 mg. We have tried to ascertain the least dose necessary for complete anesthesia. We have standardized on 50 mg. for vaginal and perineal operations and 75 mg. for laparotomies. This is about one-half the average dose used by various authorities, yet the anesthesia is perfect.

(4) *Type of Needle Used.*—Our needles are of small caliber, 22 to 20 gauge. If too large needles are used postoperative headaches occur. The Babcock short-bevel sharp needle and the Greene sharp conical pointed needle have seemed to be equally satisfactory.

(5) *The Level of the Puncture.*—We have found the fourth lumbar interspace a proper level for vaginal and perineal work, the level of anesthesia reaching up to or a little above the mons. The third lumbar interspace gives anesthesia up to or above the umbilicus, which is sufficient for low laparotomies. As these levels are below the termination of the cord proper, danger of direct cord injury is negligible, and involvement of the white rami communicantes of anterior roots, with consequent blood pressure fall, is minimal.

(6) *Diluent Used.*—We use spinal fluid to dissolve accurately measured weights of sterilized novocaine crystals in sealed ampules. This simplifies preparation of the solution and obviates the introduction into the canal of any foreign material other than the drug itself.

(7) *Force and Speed of the Injection.*—Injections are made as slowly as possible, and with no force, thus restricting diffusion, and so minimizing blood-pressure fall.

(8) *Amount of Spinal Fluid Withdrawn.*—Two to two and a half c.c are sufficient to quickly and thoroughly dissolve the novocaine. Less may limit the area of anesthesia, or prolong its onset; more is not necessary; none in excess of this required amount is removed.

(9) *Reaspiration of Spinal Fluid During the Injection.*—This is only necessary to obtain sufficient diffusion for much wider areas of anesthesia than we need; we therefore do not practice it.

(10) *Posture of Patient.*—The lateral posture is easier for the patient in active labor, entails less effort on her part, and is simple for the operator. We have used it in preference to the erect.

A special chart was devised to systematize our findings. Up to February 12, 1927, we have employed spinal anesthesia in fifty-four cases. The conditions for which it was used were:

Normal labor, second stage, termination,	10 cases
Forceps extraction	
Low:	
For mechanical indication	8
For eclampsia	1
For fetal distress	1
Median:	
For mechanical indication	11
For eclampsia	1
Breech extraction	2
Cesarean section:	
For mechanical indication	13
For placenta previa	1
For preeclamptic toxemia	1
Version:	
For mechanical indication	1
Following induction for preeclamptic toxemia	2
Vaginal Cesarean section for eclampsia seventh month	1
Manual removal placenta	1

These cases of course included, experimentally, a number of operations for which there was no special indication for spinal anesthesia.

All of the patients except four were in active labor at the induction of anesthesia, so that the efficiency of it in controlling the pain of uterine contractions was well tested.

DOSAGE OF NOVOCAINE WAS:

35 mg.	2 cases
40	4
45	1
50	32
75	10
85	2
90	1
100	2

The systolic blood pressure appeared to vary directly with the dosage:

	DOSE UP TO				
	50 MG.	75 MG.	85 MG.	90 MG.	100 MG.
a. Variation slight (less than 10 mm.) cases	13	1			
b. Variation moderate (10-40 mm.)	21	5			
c. Variation great (40-90 mm.)	5	4	2	1	2

Exclusive of the hypertension cases, the range of variation in the two dosages most used was:

	50 MG. DOSE	75 MG. DOSE
Minimum variation, mm. Hg.	0	5
Maximum	50	65
Average	23.7	38

The variation in systolic blood pressure would seem to vary also directly with the reading at the time of injection, i.e., the higher the initial systolic pressure, the greater the variation for corresponding dosage of the drug, thus:

Initial Rdg.	Variation	Initial Rdg.	Variation	Initial Rdg.	Variation
DOSE 50 MG.		75 MG.		100 MG.	
180	90	200	70	160	80
180	90	150	45	140	70
174	50	144	40		
172	45				
170	50				
150	40				
140	40				
140	40				
130	30				
130	20				
115	0				

Thus there were nine cases with variations of 50 mm. Hg. or more, and of these, all but two were in hypertension cases (initial readings of more than 140 mm. Hg.).

Actual minimum systolic readings were:

Below 100 mm. Hg.	14 cases
Down to 70	2
62	1
55	1

The effect on the diastolic pressure is less than on the systolic; the net result is therefore a decrease in the pulse pressure.

Adrenalin, subcutaneously, 3 to 5 minims, is efficacious in controlling excessive blood pressure fall, and is the only measure we have resorted to and only occasionally have we even done this.

The pulse rate, in the anesthetic doses employed, showed relatively little change; where there was variation, it was lowered in all except four cases; where the variation was more than slight, the graph tended to follow the graph of the systolic blood pressure, but the variation was not usually relatively so great.

The effect of the anesthetic on uterine contractions is to lessen or abolish them. This effect is transitory, however, and they are generally reestablished with their former vigor in from fifteen to thirty minutes, long before the termination of the anesthesia itself. The irritability of the uterine muscle is not abolished, however, as within a few minutes of the injection mechanical irritation of the cervix, such as forceps extraction, will induce uterine contractions. Such contractions may be moderately painful if the injection is in the fourth space, but only slightly so or not at all if the injection is in the third space. The postpartum uterine tone and the response to oxytocics postpartum did not in any case appear to be less than normal.

The duration of the anesthesia can be counted on for from forty-five minutes to one hour; it does not depend on the dose, nor the level injected.

A few cases lasted much longer.

1 case, 2 hours, 10 minutes	Dose 50 mg. in L4
1 case, 2 hours, 5 minutes	85 mg. in L3
1 case, 1 hour, 50 minutes	50 mg. in L4
1 case, 1 hour, 40 minutes	75 mg. in L3
1 case, 1 hour, 30 minutes	75 mg. in L3

In many cases the exact duration of the anesthesia was not noted, as observations were not continued beyond the time consumed by the procedure for which used.

The psychic reaction to the injection is generally good, only six cases having appeared disturbed. These patients were all very nervous or exhausted before the injection. The complaint in such cases is usually paresthesia of the legs. The injection itself, if a small needle be used and an anesthetic wheal made in the skin, is only very slightly painful.

There is no deleterious effect on the child whatsoever.

The only sequelae have been:

(a) Headache, and posterior cervical pain. These were complained of by six of the first patients, in whom too large needles were used. There has not been a single case of this since the employment of the finer needles. It is best treated by the flat posture, icebags to the head, and analgesics. The longest duration in any case was seven days, and the severity of the pain has not been more than moderate.

(b) One case of mild paresthesia of one thigh, which disappeared spontaneously at the end of four weeks.

(c) Four cases of vomiting during the operation; this has always been of brief duration, and as it usually comes quickly following the injection, it has not interfered with technic while the abdomen was open.

SUMMARY

We believe that this work, though small, is sufficient to show that spinal anesthesia by the technic indicated and in the dosage employed, is safe for obstetric use. The single contraindication is hypotension.

It is not fitted for first-stage analgesia by reason of its short duration.

At the termination of the second stage by the vaginal route, it causes entire soft-tissue relaxation; in selected cases this property may obviate lacerations or the necessity for episiotomy; it may be used here for any condition contraindicating general narcosis; it is of course not offered for routine use.

In obstetric laparotomies it offers the same advantages which it does in general surgery, namely, complete anesthesia, thorough muscular and visceral relaxation, relatively slight bleeding, minimal postoperative discomfort, and smooth postoperative course. These advantages are definite enough to constitute a very strong appeal to us in this field of work.

Finally, inhalation narcosis is contraindicated on physiologic grounds in pregnancy toxemia and eclampsia. Where operative procedures of any sort are undertaken in this class of case, spinal anesthesia has a very special and important indication. We believe it is directly conservative of both maternal and fetal life.

Acknowledgment is made to Dr. Joseph Binder for the privilege of including one of his private cases in this series, to Drs. Hall G. Holder and Joseph Kelso, of the resident staff of the Jersey City Hospital, and Dr. C. S. Kirkby, of the interne staff of Christ Hospital, for their collaboration.

REFERENCES

Romans viii:22. *Sherwood-Dunn:* Regional Anesthesia, Philadelphia, F. A. Davis Co. *Braun, Shields:* Local Anesthesia, Philadelphia, Lea and Febiger. *Martin and Arbuthnot:* Jour. Am. Med. Assn., Nov. 20, 1926, lxxxvii, No. 21, p. 1723. *Jarcho:* Anesthesia and Analgesia, April, 1926, p. 88-93. *Steel:* Jour. Am. Med. Assn., lxxxiv, No. 2, p. 79. *Kalyanvala:* Edin. Med. Jour., 1922, xxviii, 267; xxix, 31. *LaRiche:* Ann. Surg., Jan., 1925, lxxxi, 1-38. *Labat:* Regional Anesthesia, Philadelphia, W. B. Saunders Co. *Rytina and Tolson:* Ann. Surg., Feb., 1924, lxxix, 2-283. *Greene:* Jour. Am. Med. Assn., Feb. 6, 1926, lxxxvi, No. 6, p. 391. *Labat:* Surg. Clin. N. Am., April, 1925, p. 567. *Jonnesco:* Jour. Am. Med. Assn., Abst., March 27, 1926, lxxxvi, No. 13, p. 989. *Babcock:* Jour. Am. Med. Assn., Nov. 20, 1926, lxxxvii, No. 21, p. 1729. *Chute:* Jour. Am. Med. Assn., Nov. 20, 1926, lxxxvii, No. 21, p. 1730. *Morrison:* Brit. Med. Jour., Nov. 5, 1921, p. 745. *Cooke:* Am. Jour. Surg., Oct., 1923, xxxvii, No. 10, p. 107. *Plass and Swanson:* Jour. Am. Med. Assn., Nov. 20, 1926, lxxxvii, No. 21, p. 1716. *Sherman, Swindler, and McEllroy:* Jour. Am. Med. Assn., June 6, 1926, lxxxvi, No. 23, p. 1765. *Levy:* Anesthesia and Analgesia, April, 1926. *Farr:* Arch. Surg., March, 1926, xii, 715. *Labat:* Ann. Surg., Dec., 1921, lxxiv, No. 6, p. 673. *Vogt:* Jour. Am. Med. Assn., March 6, 1926, lxxxvi, No. 10, p. 729. *Stander:* AM. JOUR. OBST. AND GYNEC., Nov., 1926, xii, No. 5, p. 633. *Huggins:* AM. JOUR. OBST. AND GYNEC., April, 1922. *Wilson:* S. Texas Med. Rec., September, 1916, x, No. 6, p. 8.

254 UNION STREET.

URETERAL STRICTURE*

By Charles Mazer, M.D., Philadelphia, Pa.

(From the Gynecological Department of the Mt. Sinai Hospital)

The careful internist and abdominal surgeon no longer venture a diagnosis of chronic appendicitis or cholecystitis by mere palpation of the abdomen. They now realize that the absence of pyuria does not exclude the urinary tract as a possible cause of chronic abdominal pain. Some of our internists can even see a possible relation between defective drainage and medical nephritis. They, therefore, insist on a urologic study, to an extent compatible with the condition of the patient, in every case where defective drainage may give rise to abdominal pain or injury to the kidney parenchyma.

This modern attitude of our colleagues places at our disposal a large volume of urologic material for scientific and statistic study. The results justify the endeavor. Fewer women are subjected to the useless sacrifice of their gall bladders, appendices, and reproductive organs. The exploratory laparotomy for supposed adhesions is becoming a rarity.

There are still many clinicians and even some urologists who point to the dangers of ureteral catheterization as a routine measure in the search for the source and cause of chronic abdominal pain. The properly trained urologist who uses gloves and ureteral catheters sterilized by boiling is not likely to cause either traumatism or infection. In the course of several thousand ureteral catheterizations we have seen only one instance of "ureteral" chills and fever.

In urologic investigations, the ureteral stricture is so often demonstrated by means of the ureteral catheter and ureterogram that our skepticism concerning its existence must abate. Temporary and permanent cures secured by dilating these strictures are too numerous to permit any doubt of their clinical entity.

Although clinical observations corroborated by ingenious diagnostic procedures are sufficient to convince the most exacting scientific mind, the relative paucity of pathologic data, operative and postmortem, is the most important factor for controversy. The reason for this scarcity of pathologic data is apparent. An uncomplicated ureteral stricture rarely requires operative interference. When infection, due to defective drainage ensues, the primary condition is overshadowed by the kidney infection. It then becomes difficult to differentiate between cause and effect. However, even when of secondary development, these strictures assume primary importance, because faulty drainage precludes the possibility of relieving the original infection. Moreover, cases of uncomplicated ureteral stricture do not end fatally; hence, postmortem evidence concerning the existence of this condition is relatively scarce. Few pathologists have thus far made an earnest attempt to search for ureteral strictures routinely.

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*Read before the Philadelphia Obstetrical Society, January 6, 1927.

A ureteral stricture is a narrowing of a part of the lumen by inflammatory reactions within the ureteral walls. In uncomplicated cases, the area involved is too small to give rise to frank pyuria, and the hydronephrosis which eventually supervenes is usually relatively sterile. This is one of the strongest arguments in favor of their primary nature because a preexisting infection higher up could not have subsided in the presence of faulty drainage.

Infection without back-pressure does not cause dilatation of the ureter and kidney pelvis, hence where ureteropyelography demonstrates dilatation, obstruction below the point of dilatation must exist.

Eisendrath[1] proved experimentally that the amount of fluid and pressure are of little importance in widening the shadow of a normal ureter, but when inflammatory changes are present, artificial widening of the ureter is possible. It is therefore necessary to withdraw the ureteral catheter and permit the excess of fluid to escape through the ureteral orifice before exposure is made. Whether the obstruction is due to causes within the ureter or to compression of the tube by adhesions, exudates, or tumors in its vicinity, the ultimate result is a varying degree of dilatation of the ureter and kidney pelvis. At times one part of the ureter bears the brunt of the back-pressure, and at other times the kidney pelvis responds sooner, depending on the congenital development of the musculature and the degree of support the affected organs receive from the surrounding structures.

Back-pressure due to an obstruction in the lower ureter causes an increase in length as well as in width of the ureter above the point of obstruction, hence the tortuosity and so-called kinking frequently seen in dilated ureters. Ureterography, after the removal of the obstruction, usually shows an almost total disappearance of the so-called kinks and dilatations. These apparent kinks are due to superimposed portions of the redundant ureter.

True kinking occurs where the upper ureter is fixed by adhesions or aberrant renal vessels, and the respective kidney has undue mobility so that the upper ureter does not sag with the kidney. The ureter below this point is not dilated unless a greater degree of obstruction exists at some point below.

Ureteral strictures, according to Hunner,[2] occur most frequently where the ureter has its chief lymphatic connections; namely, in the broad ligament and at the bifurcation of the internal iliacs. The presence of extraureteral shadows due to calcified glands denotes, in his opinion, chronic local infection, past or present.

Our observations are based on a study of one thousand consecutive urologic studies, a large number of which were referred to us for diagnosis by the medical service.

NUMBER OF CASES STUDIED	1000	
Primary ureteral stricture cases	122, or	12 %
Ureteral stricture with a varying degree of infection	45, or	4.5%
Stricture with calculus	17, or	1.7%
Calculus unassociated with stricture	11, or	1 %
Pyelitis and pyelonephritis without stricture	263, or	26 %
Unilateral tuberculosis	7, or	0.7%
Papilloma of the bladder	2, or	0.2%
Hypernephroma	2, or	0.2%
Cancer of the bladder	1, or	0.1%
So-called essential hematuria	8, or	0.8%
Primary chronic cystitis without apparent cause	42, or	4 %
Cases showing no urologic pathology	481, or	48 %

The percentage of strictures in this series is much lower than that recorded by Hunner[3] who finds "ureteral stricture as an associated lesion in more than 90 per cent of all hydronephroses and chronic infections of the kidney." We record 263 kidney infections without associated strictures. The reason for the difference in our findings may be found in the rigid rules governing the diagnosis of ureteral stricture in this study. Infected cases that offered no obstruction to the passage of a No. 6 catheter and showed no evidence of ureteral dilatation are classified as kidney infections unassociated with stricture. The fact is that prior to fibrous tissue formation, a No. 6 catheter may easily pass a soft infiltrated area in the ureteral wall. It is also well known that dilatation due to narrowing of the lumen does not occur until nature has made attempts to overcome the impediment through hypertrophy of the musculature in the ureteral wall and kidney pelvis. Dilatation marks nature's failure to overcome the defect and is a rather late development.

Bilateral involvement was found in 6 per cent of ureteral strictures. This is at variance with the statistics of Hunner[3] who finds the condition "practically always bilateral." The right ureter was the sole seat of trouble in 62 per cent of our stricture cases.

It is also interesting to note how infrequently we find a primary chronic cystitis not due to faulty catheterization.

Only about 25 per cent of ureteral-stricture cases showed gross evidence of infection; some of the others showed a few leucocytes in the urine or a positive culture for colon bacilli or staphylococci.

The relative frequency with which renal calculi are associated with stricture points to a possible causal relation. Theoretically, impairment of renal drainage favors salt deposits.

Rathburn[4] found ureteral strictures in 92 out of 739 cases studied. He also stresses the fact that a No. 6 catheter may pass a stricture unnoticed.

ETIOLOGY

There is an abundance of clinical evidence that distant foci of infection are frequently responsible for the segmental ureteritis which results in stricture formation. Associated infection of the tonsils, accessary sinuses, or teeth was found in 80 per cent of the 122 primary ureteral strictures. Attempts to prove relationship by animal inoculation of the virus, obtained from these foci, failed to demonstrate elective localization in the animal. Poor facilities for animal experimentation are responsible for our failure. In one case of persistent renal hematuria due to a stricture, relief was secured by repeated duodenal drainage of an infected gall bladder.

Cervical infections, in our opinion, bear a causal relation to ureteral stricture. The fact that most strictures are found in the lower part of the ureter which has a lymphatic connection with the cervix and the relative prevalence of ureteral stricture in women seem to support this view. Laura M. Moench[5] demonstrated the pathogenicity of the normal cervical flora through animal inoculation of saline suspensions of the leucorrheal material.

CLASSIFICATION OF SYMPTOMS

Number of primary ureteral stricture cases	122
Symptoms simulating chronic appendicitis	57, or 46%
Symptoms simulating gall bladder disease	9, or 7%
Renal colic of varying degree	21, or 16%
Tenderness and pain in the region of the kidney	21, or 16%
Increase in urinary frequency	78, or 62%
Aggravation of symptoms during menstruation	51, or 42%
Pain and tenderness in the left lower abdomen	32, or 25%
Renal hematuria as the only symptom	1

The symptoms of uncomplicated ureteral stricture are usually not sufficiently characteristic to warrant a diagnosis without the aid of the cystoscope and roentgen rays. The severity of the symptoms depends upon the degree of interference with renal drainage. A quiescent stricture may, through the development of a fresh inflammatory reaction or mere congestion incident to menstruation, become sufficiently constricted to give rise to renal colic. When infection ensues, these attacks of renal colic are associated with chills and fever,—Dietl's crisis.

We have recently seen a case of uremia in the course of an advanced cervical carcinoma. Postmortem examination showed infiltration of the lower end of both ureters and enormous dilatation of the ureters and kidney pelves. To what extent defective renal drainage is responsible for chronic nonsuppurative nephritis is a fertile field for investigation.

CONCLUSIONS

1. Urologic investigation in a large number of cases presenting chronic abdominal pain of obscure origin showed that the urinary tract was responsible for the symptoms in almost 50 per cent.

2. Ureteral catheterization should be carried out with the same precision of asepsis as a major operation.

3. Primary ureteral stricture is frequently encountered in the course of urologic investigation.

4. Ureteral stricture associated with sterile hydronephrosis or hydroureter is unquestionably a primary condition, because a preceding infection above the point of stricture could not clear up in the presence of defective drainage. When associated with infection, it is difficult to differentiate between cause and effect.

5. Obstruction in the lower end of the ureter causes an increase in length as well as an increase in the caliber of the ureter above the point of obstruction. Apparent ureteral kinks are due to overlapping of the redundant ureter.

6. Diagnosis of ureteral stricture is based on the following combined evidence:

a. Difficulty in passing a No. 6 catheter.

b. The reproduction of symptoms in an aggravated form when fluid is instilled into the kidney pelvis, because of trapping of the fluid beyond the constriction.

c. Dilatation of the urinary tract above the point of obstruction as evidenced by the ureterogram.

7. One of the exposures in ureterography should be made after the ureteral catheter is withdrawn in order to avoid artificial widening of the shadow through distention.

8. There is an abundance of clinical evidence that distant foci of infection are frequently responsible for primary ureteral stricture. (Owing to poor laboratory facilities we have been unable to prove this experimentally.)

9. The essentials in treatment are the removal of every possible focus of infection and graded dilatation of the stricture area by means of bougies.

REFERENCES

(1) *Eisendrath, D. N.:* Surg., Gynec. and Obst., 1925, xli, 557. (2) *Hunner, G. L.:* Cabot's Modern Urology, Lea and Febiger, 1924, ii, 298. (3) *Hunner, G. L.:* Surg., Gynec. and Obst., 1926, xliii, 615. (4) *Rathburn, N. P.:* Jour. Urol., 1925, xiv, 403. (5) *Moench, Laura M.:* Jour. Lab. and Clin. Med., 1924, ix, 289.

1829 PINE STREET.

COLPORRHEXIS, OR RUPTURE OF THE VAULT OF THE VAGINA, WITH THE REPORT OF A CASE*

By Thomas O. Gamble, M.D., Albany, N. Y.

LACERATIONS of the upper third or vault of the vagina during labor are uncommon. When such injuries occur, they are usually the result of trauma accompanying manual dilatation of the cervix, instrumentation, or too rapid extraction through a partially dilated cervix. In most instances they are limited to the lateral fornices, and, almost without exception, represent extension of tears originating in the cervix. Occasionally, however, there may be more or less complete rupture of the vault of the vagina with little or no injury to the cervix or lower uterine segment. To this condition, Hugenberger, in 1875, gave the name "Kolporrhexis." and at the same time reported 40 cases which he had been able to collect from the literature.

In spite of Hugenberger's rather accurate description of this unusual complication, no clearly defined differentiation between rupture of the uterus and rupture of the vagina seems to have existed in the minds of the medical profession, as shown by the fact that during the next twenty years a number of cases of colporrhexis were reported as instances of simple uterine rupture. With the appearance of articles by Freund (1892), Schick (1893), Everke (1898), and Kaufman (1901) further confusion, to a large degree, was obviated.

A total of approximately 120 cases of colporrhexis have been reported to date, Kaufman making the last complete collection (82 cases) in 1903. It is interesting to note that only one of Kaufman's cases had been recorded by an American, and I have been able to find but two cases reported from the same source since 1903, one by Reed in 1905, the other by Martin and Brinkley in 1923. The explanation of this curious phenomenon probably lies in the rather cursory manner in which colporrhexis is treated in our textbooks. Williams, for instance, devotes but half a page to the subject in the last edition of his textbook; DeLee, approximately one page, and Edgar, 15 lines. In view of these facts, it has seemed advisable to report the following case of spontaneous colporrhexis, and at the same time to review briefly the literature upon this interesting obstetric complication.

The patient, a white woman, aged thirty-one, was registered in the prenatal clinic of the West End Health Center, in the City of Albany, on Feb. 25, 1926. There had been six previous pregnancies, five of which went to term, while the other ended in a spontaneous abortion at three months. She was attended by a private physician in each labor, the first two being terminated instrumentally, while the last three babies were born spontaneously. Nothing further could be learned concerning her labors, except that the last one, in 1923, had been long and difficult. The only other point of interest in her past history was that she had noticed a protrusion of the umbilicus for the past five years, and had had a very large and pendulous abdomen for an equal length of time. Menstruation was normal; the last period began Sept. 9, 1925, making the probable date of confinement June 16, 1926.

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*Read at a meeting of the Albany County Medical Society, April 19, 1927.

The patient was of medium height but quite obese, weighing 205 pounds. Preliminary examination was negative. The abdominal walls were very lax with marked diastasis of the recti muscles. There was an umbilical hernia with a ring about 4 cm. in diameter. The uterus was enlarged to the size of a six months' pregnancy; fetal heart was distinct in the midline. Pelvic examination showed the outlet markedly relaxed, with both rectocele and cystocele; cervix was large and soft, with the external os patulous and bilaterally torn. If any scar tissue was present in the vaginal vault it was not noted. A properly fitting abdominal support was advised. Subsequent visits were made to the clinic at regular intervals.

Labor pains began at 2:30 P.M., June 25, and the patient was admitted to the Albany Hospital at 3 P.M. Pains were occurring at three-minute intervals and lasting forty seconds. Abdominal examination revealed a large child in R. O. A., with the head just entering the superior strait, but not firmly fixed. Fetal heart in the right lower quadrant. Rectal examination showed the external os practically fully dilated with the membranes apparently intact. The head could be easily dislodged by the examining finger. This examination was made at 6 o'clock and the cervix was found to be completely dilated, but the membranes had already ruptured. With the patient in the recumbent position the uterine axis did not appear distorted. At 7 o'clock the nurse in attendance left the labor room for a few minutes, and on her return found the patient standing by the side of the bed. She stated that a sudden severe pain in the lower part of the abdomen had accompanied the act of getting up. The intern called me shortly afterwards to report the complete cessation of labor pains after the patient had been returned to her bed. Coincident with the stoppage of pains there began a rather free drainage of bright red blood from the vagina. I reached the hospital at 7:45 P.M., and found the patient complaining of severe and constant abdominal pain. A hurried external examination failed to impress me with anything unusual, except the extreme sensitiveness to palpation. The pulse rate was 110 per minute, but there was little evidence of shock. On vaginal examination the fingers came into contact with what was thought to be the margins of the completely dilated cervix. Posteriorly and just within the external os was a smooth rounded structure which was believed to be the edge of a lowly implanted placenta. A tentative diagnosis of placenta previa was made, the patient was anesthetized, and the whole hand introduced into the vagina. The head was palpated riding freely above the pelvic brim. Not entirely sure of the exact nature of the complication, I passed my hand through the large opening, thought to be the external os, and into a cavity which did not feel at all similar to the uterine cavity. The baby's feet were seized and a version and extraction easily and quickly accomplished. The baby was stillborn and weighed 4530 grams. Immediately after extracting the child I was shocked to see a small bit of fatty tissue protruding from the vaginal orifice. On closer inspection this proved to be a loop of intestine with its fatty epiploic appendages. Believing I was dealing with a rupture of the uterus I replaced the intestine, packed the vagina with gauze, and ordered the patient to the operating room. Practically an hour elapsed before the abdomen was opened as it was necessary to communicate with the patient's husband before we could proceed.

At operation the placenta and a considerable quantity of blood were found in the abdominal cavity. No tear could be found in the uterus, and it was not until this organ had been removed that the true nature of the injury was clearly revealed. Then it was seen that posteriorly the vagina had been completely separated from its attachment to the cervix by a transverse tear about 8 cm. in length. Extending downward from the center of this tear was another of almost equal length, so that the whole laceration presented a T-shaped appearance.

The edges of the tear were rather friable and considerable difficulty was experienced in bringing them together. A small opening was left in the vault through which four pieces of gauze were pushed into the vagina. After removing the appendix, and repairing the umbilical hernia, the abdominal incision was closed, except at the lower angle through which drainage was provided for by a single cigarette wick.

The patient was in considerable shock following the operation but reacted well, and made an uneventful recovery. She was discharged from the hospital July 19, twenty-six days postpartum.

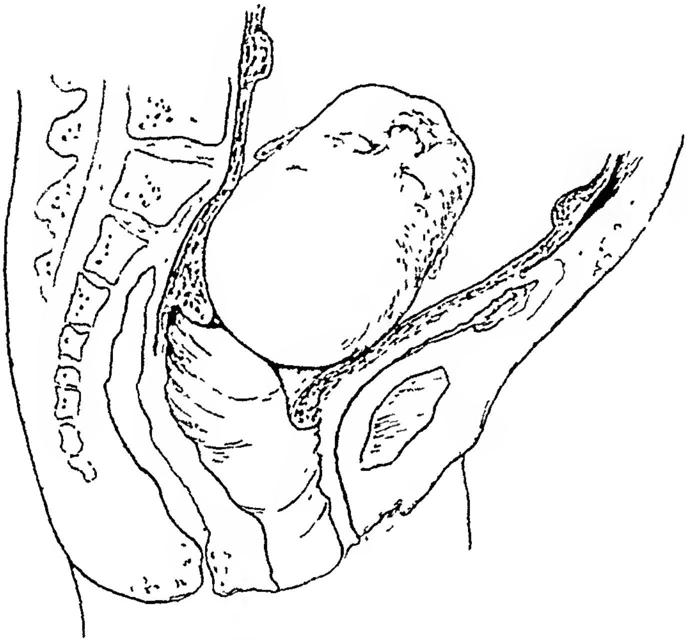

Fig. 1.—Cervix caught in front of the head. Spontaneous rupture of the vagina practically impossible.

ETIOLOGY

Most cases of colporrhexis are traumatic and perforating, and result from the unskillful use of forceps. Illustrative cases are those of Campbell and Lewis, Hellier, Everke, and Fothergill. Not uncommonly rupture may accompany attempts at podalic version, as was noted by Reed, Everke, and others. Ross says that a rough attempt to replace a prolapsed vagina has resulted in its rupture.

Spontaneous colporrhexis, on the other hand, is much less common, only 50 of the 120 cases reported falling within this group. It is in the etiology and mechanism of such cases that we are especially interested. Freund's theory, based upon the doctrine of the lower uterine segment and the formation of the contraction ring as elaborated by Bandl, is the one generally accepted. When, under the influence of uterine contractions, the descending part meets with some obstruction, the uterus slowly becomes retracted, the contraction ring rises to a higher and higher level, and the passive lower uterine segment is gradually thinned out. If the lips of the cervix are incarcerated between the presenting part and the bony pelvic brim, rupture of this thinned-out lower segment will eventually occur, unless the condition is relieved by prompt delivery. (Fig. 1.) Spontaneous rupture of the vault of the vagina under such conditions Freund believes to be impossible. When, however, the lips of the cervix are not fixed, there is a retraction of the whole of the birth canal, from the contraction ring down to the attachment of the vagina to the pelvic floor. The cervix in such instances is drawn upward over the head, and when rupture occurs, it is at the weakest point, usually the posterior fornix. (Fig. 2.) Conditions under which the above mechanical factors may be fulfilled are to be observed in some cases of transverse presentation, extreme pendulous abdomen, and marked degrees of hydrocephalus. Kaufman believes that in addition to the mechanical factor, we must assume a predisposition of the tissues to rupture, but states that the only anatomic changes so far demonstrated are those which accompany repeated pregnancy. Oelschlägel points out that these anatomic changes result from the circulatory disturbances accompanying the displacements and varying degrees of prolapse of the uterus and vaginal walls so commonly observed in multiparous women, and consist of atrophy, rarefaction, and hyalinization of the musculature and connective tissue. It is to be noted, in this connection, that spontaneous colporrhexis has not as yet been observed in a primiparous woman, whereas, in over 50 per cent of the cases occurring in multiparae there have been from 6 to 14 previous pregnancies in each instance.

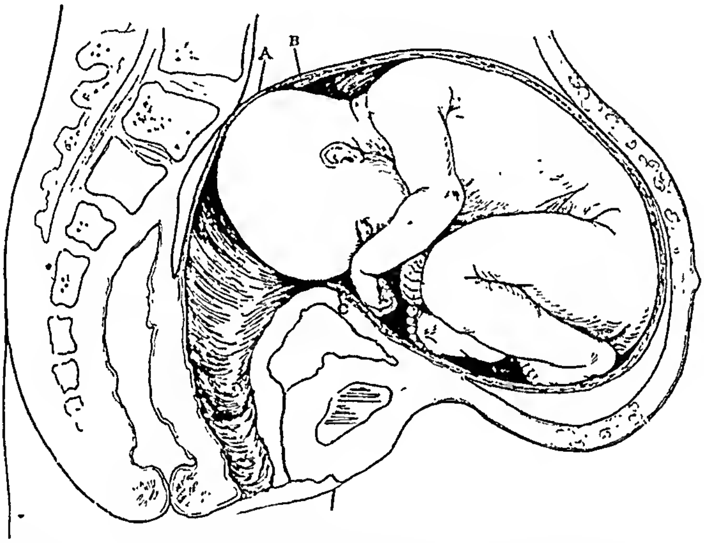

Fig. 2.—Forward and downward displacement of the fundus due to pendulous abdomen. Cervix drawn above the head. *A,* Point of rupture. *B,* Posterior lip of the cervix. *C,* Anterior lip.

The presence of scar tissue in the vaginal vault, such as might result from a pelvic abscess which has drained at this site, or from a previous rupture, traumatic or spontaneous, must be listed as predisposing causes of colporrhexis.

In considering the etiology of the case here reported, particular emphasis should be placed upon the pendulous abdomen. With the patient in the recumbent position there was such slight distortion of the normal axis of the uterus that the force exerted by its contractions was almost perpendicular to the plane of the superior strait. On the other hand, the moment the patient stood upright, the body of the uterus sagged downward, thus drawing the cervix above the level of the child's head, and placing the posterior wall of the vagina

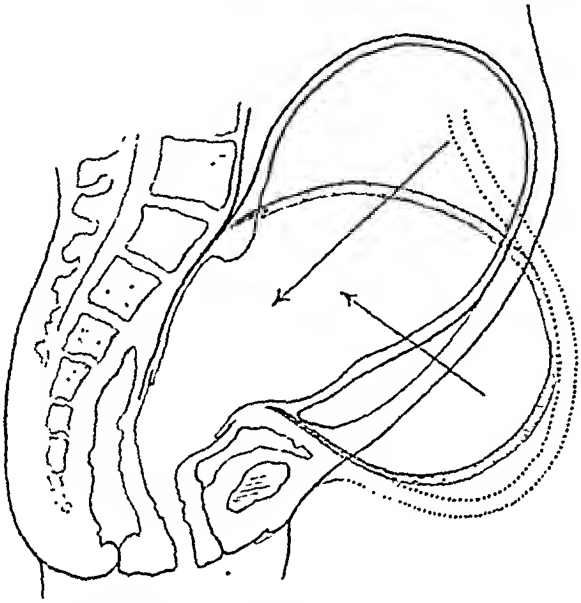

Fig. 3.—Diagram of the distortion of the uterine axis when the fundus sags downward in a pendulous abdomen.

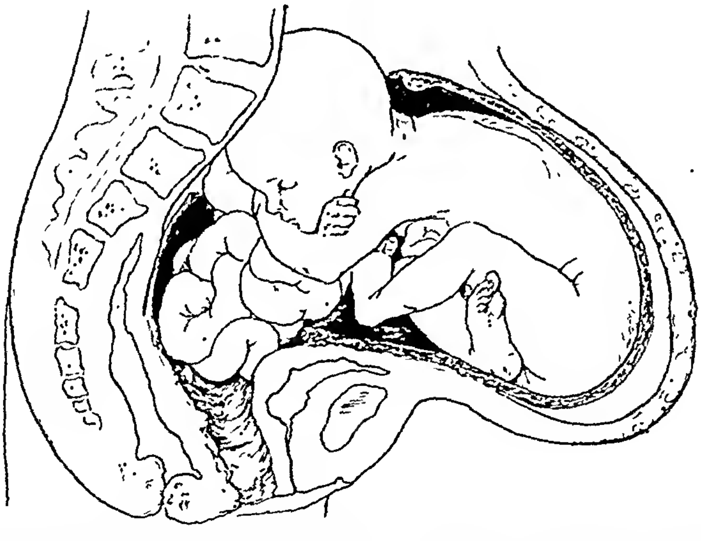

Fig. 4.—Rupture of the posterior vaginal wall with fetus being expelled into the abdominal cavity. Prolapse of intestine into the vagina.

under such tension that rupture occurred. At the same time the expulsive force of the uterus was directed upward and backward, so that the fetus was extruded through the torn culdesac into the abdominal cavity. (Figs. 3 and 4.)

PATHOLOGY

The shape and extent of the tear and the amount of damage to the adjacent tissues varies considerably with the individual case. If the rupture is traumatic and limited mainly to the anterior fornix, the bladder and urethra are frequently involved. Lateral fornix tears may extend upward into the broad ligaments, and in such cases the bleeding may be profuse due to injury to the uterine vessels. Where rupture has taken place in the posterior fornix, the vagina may be entirely separated from its attachment to the cervix in this location. The tear usually runs transversely, and frequently there is a downward extension along the posterior wall of the vagina, the whole laceration presenting a T-shaped appearance. Saks reports a case in which there was an almost complete detachment of the vagina from the cervix, laterally and anteriorly as well as posteriorly, so that the latter was literally hanging by a thread. Usually the peritoneum is torn, but rarely it may remain intact and be dissected upward as high as the level of the umbilicus. Kaufman reports a case in which the placenta was found lying in such an extraperitoneal cavity.

SYMPTOMATOLOGY

Clinically colporrhexis presents a picture similar to that observed in rupture of the uterus, though the symptoms of shock are usually much less severe. In cases in which the fetus is extruded into the abdominal cavity, there is a sudden and complete cessation of labor pains. The patient complains of a sensation of "something having given way" in the lower part of the abdomen or vagina. Following this there is constant pain in these locations. Palpation reveals an unusual degree of sensitiveness to touch, while the fetal outlines are much more easily made out than previously. The amount of vaginal bleeding depends upon the site of rupture, being most profuse where there is involvement of the uterine vessels. With tears of the posterior fornix, the hemorrhage is usually moderate and occasionally may be almost entirely absent. Not infrequently several loops of the intestine may prolapse into the vagina. If the patient is not seen until a number of hours after the accident, the symptoms of beginning peritonitis may be superimposed upon those of shock.

DIAGNOSIS

The only condition with which colporrhexis may be confused is that of uterine rupture. The diagnosis can be determined by careful digital exploration.

PROGNOSIS

The prognosis in colporrhexis is grave, death almost invariably being due to peritonitis. Hugenberger reported a mortality of 72.5 per cent; Garnis, 62.5 per cent, and Sehtschotkin, 67.5 per cent. Kaufman believes that these figures are unduly high, and asserts that the mortality should not exceed 25 per cent.

TREATMENT

Considerable difference of opinion exists as to the most appropriate treatment. Williams agrees with Schick that laparotomy is the best method of coping with the emergency, and recommends the extirpation of the uterus when the torn surfaces of the vagina cannot be united by sutures. Kaufman urges the invariable extraction of the fetus through the vagina, even though craniotomy be necessary, followed by closure of the rent from below if possible. In many of the cases reported, the only treatment consisted in the extraction of the child and the tamponade of the vagina with gauze. Everke very strongly urges the retention of the uterus whenever possible. Naturally, the question arises as to what is the best method of dealing with future pregnancies in women who have previously been the victims of this accident. Theoretically, at least, labor in such women is very dangerous, for in addition to the factors previously present, we have the scar resulting from the rupture. Kaufman records three instances of women going through labor successfully after previous colporrhexis. Kalomenkin, Baumbach, and Saks, on the other hand, have reported cases of rupture of the vagina for a second and third time in the same patient. Accordingly, it would seem that all patients who have had previous colporrhexis should be in the hospital during the latter weeks of the next succeeding pregnancy, and cesarean section, with sterilization, performed either before or at the onset of labor.

CONCLUSIONS

1. Colporrhexis is a serious complication of labor, and is of more frequent occurrence than a review of the American literature would indicate. 2. Its importance has been underemphasized in our textbooks. 3. A majority of the cases of colporrhexis are of traumatic origin. 4. The case of spontaneous colporrhexis reported emphasizes the importance of the pendulous abdomen as an etiologic factor.

REFERENCES

Hugenberger: Petersburger med. Ztschr., 1875, v, No. 5. *Freund:* Ztschr. f. Geburtsh. u. Gynäk., 1892, xxii, 436. *Schick:* Prag. med. Wchnschr., 1893, xxiii, 355. *Ross:* Am. Jour. Obst., 1898, xxxvii, 449. *Everke:* Monatschr. f. Geburtsh. u. Gynäk., 1898, vii, 233; Monatschr. f. Geburtsh. u. Gynäk., 1923, lxi, 250. *Kaufman:* Monatschr. f. Geburtsh. u. Gynäk., 1901, xiii, 464; Arch. f. Gynäk., 1903, lxviii, 152; Monatschr. f. Geburtsh. u. Gynäk., 1910, xxxii, 148. *Baumbach:*

Deutsch. med. Wchnschr., 1903, xxix, 34. *Kalomenkin:* Monatschr. f. Geburtsh. u. Gynäk., 1903, xvii, 349. *Townley:* Lancet, London, 1904, ii, 951. *Fothergill:* Jour. Obst. and Gynec. Brit. Emp., 1905, viii, 403. *Reed:* Am. Jour. Obst., 1905, lii, 440. *Campbell and Lewis:* Brit. Med. Jour., 1906, ii, 141. *Hellier:* Brit. Med. Jour., 1906, ii, 865. *Saks:* Zentralbl. f. Gynäk., 1906, xxx, 480. *Palmer:* Proc. Roy. Soc. Med., 1920, xiii, 151. *Martin and Brinkley:* Virginia Med. Month., 1923, l, 457. *Freund:* Arch. f. Gynäk., 1925, cxxv, 602. *Waldstein:* Monatschr. f. Geburtsh. u. Gynäk., 1924, lxv, 159. *Oelschlägel:* Zentralbl. f. Gynäk., 1926, lx, 541.

24 DOVE STREET.

AN ANALYSIS OF THE MATERNAL AND FETAL DEATHS IN A SERIES OF TWO HUNDRED NINETY-ONE CESAREAN SECTIONS

BY HILLIARD E. MILLER, M.D., F.A.C.S., NEW ORLEANS, LA.

(From the Department of Gynecology of the School of Medicine of Tulane University)

THE report recently made by the New Orleans Gynecological and Obstetrical Society, which covers the cesarean sections performed in six of the hospitals of the city over a period of six years, and which is shortly to appear in the New Orleans Medical and Surgical Journal, contains much material worthy of further intensive study. Particularly does it seem to me that an analysis of the maternal and fetal deaths in the series cannot fail to be of value, since, after all, the principal reason for cesarean section is to save two lives, and a high fetal and maternal mortality, as this undoubtedly is, definitely defeats that purpose.

It might be well, first, briefly to summarize the findings of the special committee appointed by the Society from the six hospitals represented in its membership to make the report (Dr. E. L. King, Chairman, Charity Hospital; Dr. John F. Dicks, Mercy Hospital; Dr. Hilliard E. Miller, Touro Infirmary; Dr. P. B. Salatich and Dr. H. V. Sims, Hotel Dieu; Dr. T. B. Sellers, Baptist Hospital; Dr. C. A. Wallbillich, Presbyterian Hospital). During the years covered by the report, 1921 to 1926, inclusive, two hundred, ninety-one cesarean sections were performed in the six hospitals, and the incidence, based on the fifteen thousand, two hundred and ninety deliveries in the same period, was about 1.93 per cent. The committee regarded it as worthy of special comment that the lowest incidence, 1.2 per cent, was at Charity Hospital, where the highest percentage of abnormal labors is naturally handled, and congratulated the staff, in the words of Williams, "on permitting so many operative possibilities to escape." The ages ranged from thirteen to forty-five, and the stage of gestation from five months in one case to term in 81.4 per cent. Previous abnormal labors had included thirty-five stillbirths, four craniotomies and fifty cesarean sections; five of the latter had been done for the second time.

More than a quarter of the operations were done by three men, one an obstetrician, two general surgeons, and twenty men had performed one operation each. The classical technic was employed in seventy-two cases in which operative details were given, the Porro in 4.2 per cent, the transperitoneal low cervical technic in 12.7 per cent, and miscellaneous procedures in 11.1 per cent. Sterilization by resection of the tubes was done in 11 per cent of the cases, and simultaneous operations included myomectomy once, complete hysterectomy for carcinoma of the cervix once, and appendectomy once, eclampsia being the indication for the surgical delivery. The study of the position of the fetus and the measurements is of little value, and the committee felt obliged to comment, in view of the number of times this information was lacking, that such facts are essential to any complete obstetric record. They also comment on the fact that in but seven of the fifty cases which had been previously submitted to cesarean section was the scar adequately described, which they characterize as almost a calamity, in view of the fact that only by such studies as this can any definite conclusions be reached as to the wisdom of permitting future spontaneous labors after cesarean section. The operation was elective in 18.2 per cent of the cases, and a definite test of labor was permitted in 8.2 per cent. Labor had begun in 50 per cent, the duration ranging from under five hours in six cases to over seventy-five hours in two. The number of examinations ranged from one in forty-five cases to nine in one; seven patients had had only rectal examinations and nineteen had had none at all. In the twenty-four cases in which it was stated specifically, that the membranes had ruptured, the duration of the rupture ranged from under five hours in six to over forty-five hours in three. Previous manipulations included packs, forceps, version, craniotomy, excision of cervical tissue (for immediate diagnosis in suspected carcinoma of the cervix), artificial rupture of the membranes (hydramnios), manual dilatation and bags. The principal indications included contracted pelvis, eclampsia, other toxemias, placenta previa, premature separation of the placenta, disproportion, previous dystocia, previous abdominal delivery, malpositions, inertia and prolonged labor, and undilatable cervices due to previous operations. There was also a miscellaneous group of promiscuous indications, as might be expected in a series of operations done by sixty different men. Distention was a feature of the convalescence in 36.9 per cent of the cases, and vomiting in 27.4 per cent. The recovery was definitely febrile in 63.5 per cent (based on the criterion of fever above 101° at any time, or fever above 99° for more than three days). Complications included the various types of obstetric and surgical conditions to be expected after laparotomy performed for these indications; it is worthy of special mention that dilatation of the stomach was a marked feature in seventeen cases.

The mortality tables, taken without change from the report of the Committee, are herewith appended.

An analysis of the maternal mortality from the standpoint of indications for operation (Table I) confirms, first of all, the fact which is now universally admitted, if not always universally applied, that eclampsia per se is not an indication for cesarean section. Out of forty-one eclamptics in this series of two hundred ninety-one cases, seventeen were lost, a mortality for that condition of over 41.5 per cent. More than one writer has called attention to the dual mortality of eclampsia, from the disease itself and from the radical measures employed to combat it, and in my opinion, not only the gross mortality

TABLE I. MATERNAL MORTALITY (47-16.1 PER CENT)
ANALYZED AS TO OPERATIVE INDICATIONS

Contracted pelvis	8	(out of 107)
Eclampsia	17	(out of 41)
Other toxemias	3	(out of 12)
Placenta previa	3	(out of 33)
Premature separation placenta	1	(out of 6)
Disproportion	1	(out of 16)
Inertia and prolonged labor	5	(out of 28)
Cervical scar tissue	1	(out of 10)
Rupture uterus or scar	3	(out of 5)
Cardiac lesions	2	(out of 4)
Fibroids	2	(out of 2)
Not stated	1	(out of 2)
Total	47	

TABLE II. MATERNAL MORTALITY ANALYZED AS TO CAUSES OF DEATH

Peritonitis	6
Septicemia	3
Rupture uterus or scar	3
Toxemia	3
Eclampsia	16
Placenta previa	1
Premature separation placenta	1
Acute dilatation of stomach	2
Pneumonia	1
Vaginal hemorrhage	2
Heart lesions	2
Embolus	5
Doubtful	2

TABLE III. MATERNAL MORTALITY ANALYZED AS TO DURATION OF LABOR

Elective	3	
Test of labor	1	
Labor not begun	20	(mainly eclampsia)
Labor begun	23	
Examined (stated)	15	(probably several others)
Membranes ruptured (stated)	4	(probably others)
Pack	1	
Attempts at delivery	1	(version, forceps, craniotomy)
Fever at operation	2	

TABLE IV. FETAL MORTALITY (55-18.9 PER CENT)

Pelvic contraction	2	(1 attempted high forceps)
Placenta previa	13	(9 premature)
Premature separation placenta	4	(1 premature)
Eclampsia	8	(4 premature)
Toxemias	7	(4 premature)
Rupture uterus or scar	5	
Neglected labor	6	(1 premature)
Congenital malformations	4	
Tonic contraction of uterus	1	
Cerebral hemorrhage	1	(placenta previa)
Prematurity	1	
Uterine fibroids	1	
Doubtful	2	
Total	55	(20 premature)

TABLE V. MATERNAL AND FETAL MORTALITY ANALYZED BY YEARS

YEAR	MATERNAL	FETAL
1921	22 per cent	20 per cent
1922	26.3 per cent	21.5 per cent
1923	11 per cent	22.2 per cent
1924	12.5 per cent	17.5 per cent
1925	14 per cent	14 per cent
1926	10 per cent	10 per cent
Total	16.1 per cent	18.9 per cent

in this study, but the fact that more than 50 per cent of the women who were lost died within three days after operation, some of them within a few hours, seems to prove that the additional shock of such an operation is more than a thoroughly toxic patient is able to endure. Moreover, such a mortality is entirely unnecessary. Even the poorest of the conservative measures gives better results than this, and Stroganoff's latest reported mortality is less than 3 per cent. On the service of Dr. C. Jeff Miller at Charity Hospital, to quote results with which I am familiar at first hand, the employment of the modified Stroganoff method has reduced the maternal mortality to approximately 8 per cent, and I am aware that equally good results are reported from other clinics.

Of course if an absolute indication exists, in connection with the eclampsia, for the performance of cesarean section,—which was not the case in any instance in this series,—then we have no choice but to subject the patient to the additional risk. I am willing to grant, theoretically, that this mode of delivery may be warranted in the occasional case in which conservative measures have not availed, when the patient is a primipara and the cervix is long and rigid, so that induction of labor would mean extensive manipulations, thus increasing the risk of sepsis to which these women are notoriously liable, and the labor itself would probably be long and tedious. Cesarean section, however, is never justified in the acute convulsive stage, and personally I have never seen a case in which I considered it justified at all.

Equally unwise, in the average case, is the performance of cesarean section for other toxemic conditions, as the death rate of 25 per cent in this series quite clearly proves. Most of these complications can be handled satisfactorily by conservative measures, and if an increasing toxemia seems to demand emptying of the uterus, induction of labor by bag or catheter offers decidedly less risk to the patient.

The mortality for cesarean section in placenta previa in this series is less than 10 per cent, which on the surface appears excellent. I question, however, whether even that mortality is necessary in this complication. There is no doubt that abdominal delivery is occasionally warranted, particularly in the central type, when the patient is in good condition, at or near term, when infection is absent, or rather when infection has not been introduced by promiscuous examinations and other vaginal maneuvers, and when there is reason to believe that a living child may be secured, conditions which are seldom met in general practice. That other, more conservative measures, however, give better results in the average case is beyond dispute. In a series of cases studied by Dr. C. Jeff Miller in 1924 from the records of Charity Hospital, all but one of the deaths occurred in the group handled by radical measures, including cesarean section, and three-quarters of the morbidity occurred in the same group, which seems more than a coincidence. Moreover, in eighteen cases handled on Dr. Miller's own service, where conservative treatment has long been the rule, the mortality was zero, which again seems more than a coincidence.

In premature separation of the placenta the situation is different and cesarean section is frequently a justifiable procedure. This is particularly true when there is reason to believe that there has been a marked extravasation of blood into the uterine musculature, so that the organ is incapable of further contraction, even after the child has been delivered, and hysterectomy may be necessary as a life-saving measure. This mortality, one out of six cases, is certainly not exceptionally high.

The eight deaths in contracted pelves occurred mainly, as might be expected, in unrecognized or neglected cases. A detailed study of the records makes it obvious that in many of these patients the contraction was of such a character that vaginal delivery was either impossible or extremely unlikely, and the fact that long and exhausting labors were permitted, which, to judge from the records, could not possibly be described as trial or test labors, seems to indicate that either faulty diagnosis or frank carelessness was responsible for the mortality. In the same category must be set down the one death in the sixteen cases of disproportion and the five deaths in the twenty-eight cases of uterine inertia or prolonged labor. Craniotomy, particularly on a living child, is naturally repulsive, but I question seriously whether it is any more repulsive than the performance of cesarean section on exhausted and infected women, as many of these obviously were. The fact that in many instances the patients were admitted in this condition, after hours of labor, does not lessen the responsibility of the operating surgeon, in whose hands the final decision rests. It has long been recognized that cesarean section entails a definite risk when the patient has been in labor for hours, when the membranes have long been ruptured, when repeated examinations have been made, and when vaginal delivery has been attempted. The comprehensive studies of Routh and Holland have proved this point so adequately that further reiteration is unnecessary, but a study of Table III, which analyzes the deaths from the standpoint of the duration of labor, is illuminating.

In this connection, too, I would call attention to the very valuable study recently made of the bacterial content of the uterus at cesarean section by Harris and Brown of the Johns Hopkins Hospital and reported in the February, 1927, issue of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY. In practically every case in which the operation was done later than six hours after the onset of labor, bacteria, sometimes of a very virulent type, were found in the lower uterine segment.

It is significant, too, that in five-sixths of the patients lost in whom labor had not begun, the indications were mainly eclampsia, other toxemias and placenta previa. In one case in which the indication for abdominal delivery was the presence of fibroids, the child was dead on admission and the patient was frankly infected, the temperature being over 100° F. at the time of operation.

Analyzing the figures from the standpoint of the immediate cause of death, six deaths from peritonitis seems unusually low, and I am inclined to agree with the committee that this is probably incorrect. The death of two patients from postoperative vaginal hemorrhage is rather unusual, particularly in view of the fact that three other patients, who recovered, developed the same complication. The incidence of embolus, five out of forty-seven cases, is quite high, but careful study of the records shows that the diagnosis is definite from the clinical side, and in one instance it was verified by autopsy. In one case in this group the indication for abdominal delivery was an undilatable cervix due to extensive scar tissue, and death occurred on the table, just as the skin sutures were being inserted.

The deaths from rupture of the uterus after cesarean section of course carry their own lesson, that when a woman has once been delivered abdominally, her life is in jeopardy in all future pregnancies unless the utmost watchfulness is practiced throughout her pregnancy and labor. In one of these cases the administration of three doses of pituitrin after hours of hard pains seems an almost inexplicable procedure, and in another instance it is equally difficult to understand why a patient who had had a markedly febrile convalescence after her former cesarean (for placenta previa) should have been permitted to continue in labor for more than twelve hours before her admission to the hospital; rupture occurred an hour after admission.

For some reason, cesarean section, even when done under the most favorable conditions and as an elective procedure, seems to carry with it a mortality higher than that which accompanies the average operation. Polak estimates it at 2 per cent, but our figures, three out of the fifty-four elective cases in the series, 5.5 per cent, are even higher. One of these patients had multiple fibroids and myomectomy was done; death occurred on the fourth day, apparently from acute dilatation of the stomach, possibly from peritonitis. The second patient had a generally contracted pelvis, and death occurred four hours after operation, from vaginal hemorrhage. The third case should possibly not be classed as elective, since the patient's condition, due to a heart lesion, was bad when operation was undertaken. Even with this case excluded, however, the mortality in the elective group is 3.7 per cent.

In one of the fatalities the technic is described as "extraperitoneal," and the exact nature of the procedure is unknown. In two instances the Porro operation was done, one the case of infected myomata already described, the other a face presentation in which other methods of delivery had failed, including manual rotation of the head, version, forceps and craniotomy. In the latter case, at least, it is doubtful whether any technic could have saved a woman already so frankly infected. All of the other deaths followed the employment of the classical technic. As a matter of interest I might add that during the last two and a half years which the study covers, thirty-one operations were done by the transperitoneal low cervical technic (mainly the laparotrachelotomy described by DeLee), without a single fatality, in spite of the fact that in several instances the patients were undoubtedly infected. Personally I have used only this technic for the last two years, and because of the uniformly successful results I have widened my indications for cesarean section in that I am now delivering patients by this method where once I should not have dared to attempt it.

Glancing at the fetal mortality, one is struck first by the fact that twenty out of the fifty-five deaths, roughly 36 per cent, occurred in premature children. Immediately the question arises whether cesarean section is justified in premature babies. It is, of course, difficult to establish academic rules, but speaking categorically, I would say that it is practically never justifiable under the eighth month, with the possible exception of a central placenta previa, in a primipara, when it may be done at any time, without regard for the child, as a life-saving measure for the mother. Prior to the eighth month the complications of pregnancy, which are mainly hemorrhage and toxemia, can be better handled from the mother's standpoint by other methods. Moreover, few of them demand prompt evacuation of the uterus, and it is obviously unfair to the mother to subject her to the additional risk which even an elective cesarean implies for the sake of a child whose viability is, at the best, doubtful, since hemorrhage and toxemia are the two conditions which do most to jeopardize the life of the child in utero.

In this series, 20 per cent of the babies born of eclamptic mothers were either stillborn or lived but a few hours, and more than half of them were premature. Thirteen children were lost as a direct result of placenta previa, which is more than 39 per cent, and in two other instances, one of congenital malformation and one of cerebral hemorrhage, this condition was also present, so that the high fetal death rate more than counterbalances the comparatively low death rate of 10 per cent for the mothers. In the instances of premature separation of the placenta the fetal death rate of two-thirds is not surprising; rather it is surprising that any children at all were saved. In rupture of the uterus the death rate of 100 per cent is to be expected.

Of the four congenital malformations, two, a hydrocephalus and an anencephalus, were diagnosed prior to operation, which, as a matter of fact, was done in each instance on the indication of the fetal anomaly. It is hard, in each case, to comprehend the reasons. Delivery by other methods is always possible unless an absolute contraction exists, when craniotomy is warranted, and it seems scarcely fair to subject a woman to the risk of her life for the sake of a child who either cannot live or who will be a congenital idiot. The case of congenital fetal anasarca could scarcely have been diagnosed beforehand; the roentgenogram indicated a marked disproportion between the child, which weighed eleven pounds, and the maternal pelvis, which was of the borderline contracted type, and the patient had lost three previous children. Preoperative diagnosis of the fetal anomaly would, of course, have justified embryotomy. In the fourth case the operation was done for placenta previa, and the fetal condition, an incomplete interventricular septum, was not diagnosed until autopsy.

Table V shows that during the years of this study the maternal and the fetal mortality have been steadily decreasing, from the peak of 26.3 per cent for the mothers in 1922, and 22.2 per cent for the babies in 1923, to 10 per cent for each in 1926. I agree absolutely with the conclusions of the committee that this gratifying improvement is due to three distinct factors. First, eclampsia as a routine indication has been practically eliminated since 1922; the general surgeon and the occasional operator may still be doing cesarean section for this complication, but the obstetrician is not. Second, more and more the tendency is to restrict the operation to absolute indications and to eliminate its promiscuous performance on vague indications or none at all. Third, the transperitoneal low cervical cesarean section is being more and more widely employed, particularly in cases of frank or suspected infection, and on one or two services it is practically routine.

A study of the comparative fetal and maternal mortality at Charity Hospital, which may fairly be taken as representative, for the last ten years, shows that along with the steadily decreasing fetal and maternal mortality has gone a progressively decreasing incidence for cesarean section, which for the last four years has been approximately 1 per cent. Possibly these two facts are purely coincidental, but I am more inclined to agree with the Committee that the lowered mortality is attributable not only to the fact that we are doing better obstetrics, but also to the fact that we are restricting cesarean section to those cases in which it is really indicated, while at the same time we are not withholding it in those cases in which it should be done.

In spite of a progressive improvement, however, our mortality rates are still too high. When in two hundred ninety-one cases we lose forty-seven mothers, a rate of 16.1 per cent, and fifty-five children, a rate of 18.9 per cent, and when in sixteen of these cases the fatality is a dual one, surely we have no right to congratulate ourselves upon the fact that we did not lose more, which is what a complacent acceptance of the situation really amounts to. Whether women, in order to bring children into the world, should be subjected to a risk of even 10 per cent, which is apparently the best we have to offer them, is certainly a matter for grave soul-searching. My own opinion is that we have no moral right to perform cesarean section on any but absolute and established indications until every possibility of vaginal delivery has been weighed and discarded.

While it is possibly not strictly germane to the subject, these figures suggest one other consideration to me, the matter of prenatal care. How many of these deaths, at least among the mothers, could have been eliminated if such care had been given? Eclampsia is admittedly a preventable complication of pregnancy in all but a minimal number of cases, yet in this small series seventeen women died from it. Preeclamptic toxemia can likewise be prevented from becoming acute in a large majority of cases, while in the toxemias due to nephritis, the condition should be recognized and treated long before it becomes acute, even if it means the early interruption of the pregnancy. Patients with contracted pelves of the borderline type should be given the test of labor only in a hospital with proper aseptic precautions, and patients with absolute contractions should not be permitted to go into labor at all, or should be operated upon immediately after pains have begun, yet a study of these figures shows that repeatedly patients in whom cesarean section was eventually done were permitted to undergo long and exhausting labors, many times with vaginal manipulations as well, before operation was done as a last desperate resort. And finally, the hemorrhages of pregnancy, while they are not, strictly speaking, preventable conditions, are certainly complications which demand the most careful observation, as well as the prompt termination of the pregnancy, though not usually, as I have already said, by cesarean section.

During this same period, 1921-1926, but not included in this study, nine vaginal cesareans were done in these six New Orleans hospitals, and four postmortem cesareans, and a word concerning them might not be amiss. In the vaginal cases the indications included eclampsia in four cases; preeclamptic toxemia in one; an undilatable cervix due to scar tissue in one (this was a neglected case, admitted after thirty hours of labor, six vaginal examinations, and attempted manual dilatation); central placenta previa in one (this patient died on the table); pernicious vomiting in one (this was practically a postmortem affair, done just previous to the mother's death in an endeavor to save the child, earlier intervention having been repeatedly refused on religious grounds); and abdominal fixation in one (the condition was not recognized, because of an incomplete history, until vaginal manipulations had made an abdominal operation out of the question, and decapitation and embryotomy were necessary before extraction could be completed). The fetal mortality was eight, 88.8 per cent, which is scarcely surprising in view of the fact that most of the pregnancies were of only seven or seven and a half months' duration. Six mothers were lost, 66.6 per cent. These figures are not such as to encourage an extension of this mode of delivery, and as a matter of fact its field is becoming more and more limited. It is never indicated in the hemorrhagic complications, and practically never in eclampsia, now that conservative measures have superseded radical ones. It might, however, be the occasional choice in a multipara previously delivered by abdominal section for other than the absolute indication of contraction, if it were felt that the scar might not hold. The technical difficulties practically always contraindicate its performance in primiparae.

In the four postmortem cesareans the maternal causes of death included toxemia culminating in bronchopneumonia, placenta previa, rupture of the uterus and tetanus. The child born of the toxemic mother lived thirteen hours, the others were stillborn. This operation, while legally justifiable, is really warranted in only a minimal number of cases, since the baby's chances are usually negligible, particularly if the mother has died of either toxemia or hemorrhage.

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THE TOXEMIAS OF PREGNANCY IN RELATION TO CHRONIC CARDIOVASCULAR AND RENAL DISEASE*

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THE nonsurgical phases of obstetrics should have more attention from the medical practitioner than has heretofore been given. Not only do the medical aspects of childbearing call for unusual skill and discrimination in their management, they also throw light upon certain more general problems in internal medicine. Pregnancy is a great efficiency test of the maternal organism. Being not only a parasite but an activator, the fetus in its growth calls for adaptative changes in all the important organs of the mother. If pregnancy is to proceed normally, this manifold adaptation must be harmonious and coordinated. Many of the pathologic changes of pregnancy having medical interest seem to arise from failure of a given organ or system to do its share in this process. It is probably too much to say that as a woman reacts to pregnancy, so will she react to the general wear and tear of life, but if this dictum is even partially true, the pregnant and parturient woman whose reaction to pregnancy is abnormal should have the benefit of medical as well as surgical supervision.

The so-called toxemias of pregnancy present striking examples of maternal maladaptation to fetal growth. Much effort has been spent in fruitless attempts to isolate a special toxin responsible for these disorders. The attempt to learn what physical type of woman breaks down under stress of pregnancy, what pathologic changes she shows before or during pregnancy and particularly in the months and years following delivery, seems a more promising line of inquiry.

What organs or systems most frequently share in this breakdown? The liver, the kidney, the retina, the cardiovascular and the nervous systems give the most readily demonstrable clinical or necropsy evidence of pathologic change. In pernicious vomiting and acute yellow atrophy the liver seems to bear the brunt of disturbance; in other types of toxemia, the kidney; in others, the cardiovascular system. In eclampsia, the liver and nervous system may be drawn in, together with the cardiovascular and renal systems. Often mixed forms occur which baffle classification and bring up the question as to whether these types are but variants of the same species.

In this paper we shall discuss the examples of maternal maladaptation to pregnancy that exert important but not exclusive effects upon the kidney and cardiovascular systems. The evidences of these effects which we have thought of value are given in detail.

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Hypertension.—In a pregnant woman a blood pressure of 140 mm. systolic is considered hypertension. In the antepartum observations pressures were read under the ordinary conditions of an out-patient department or the medical ward and without special precautions as to posture, relaxation, etc. Contrary to the general opinion, it is our experience that the average normal pregnancy is characterized by an arterial *hypotension.* We are convinced, therefore, that the figure cited indicates definite hypertension. In our clinic all cases whose blood pressure reached 140 mm. are especially observed and measures are taken to prevent the development of further toxemia.

Albuminuria.—The heat and acetic acid test is used. A flocculent precipitate of any amount is in this report spoken of as a marked albuminuria.

Nitrogen Retention.—In a normal pregnancy the nonprotein nitrogen and urea nitrogen are low, figures for the former running about 15.0 to 30.0 mg. per cent. Cases with nonprotein nitrogen above 40 mg. are listed as examples of nitrogen retention. This distinction has been justified by the course of pregnancy in cases of this kind.

Cardiac Hypertrophy.—As a rough, practical measure of this, a point of maximum impulse four inches or more from the midsternum is considered as indicating hypertrophy. In the antepartum cases, owing to the rotation of the heart upward and outward by the pregnant uterus, this standard is inaccurate. Postpartum, however, it can be admitted and is found to fit consistently into the picture of cardiovascular changes.

Arteriosclerosis.—Sclerosis of the large vessels is judged by the condition of the brachial or radial arteries. To be termed sclerotic a vessel must not only be palpable, it must give an unquestioned impression of increased bulk and firmness. While it is admitted that changes may appear in one part of the vascular field and not in another, the clinician is dependent for direct evidence of pathologic changes in the smaller arteries upon examination of the retina. The changes looked for are constriction of the veins with or without their displacement at the points of crossing of the arteries, a general narrowing of caliber, variation in caliber or contour, hemorrhages, and white patches with or without pigment. Of lesser importance, but of value as accessory evidence, are tortuosity of the vessels and a high arterial light reflex. Such a picture may indicate a real sclerosis of the retinal arteries, or, in some cases at least, a more transient increase in their spasticity. Diffuse edema of the retina is characteristic of some types of toxemia. Patches of exudate such as are usual in albuminuric retinitis are not infrequently seen in toxemia of pregnancy. We have twice observed partial detachment of the retina.

Edema.—When not of mechanical or inflammatory origin, edema is assumed to imply a cardiovascular or renal disturbance.

Rough though such clinical criteria may be, they will serve to throw light upon the reaction of the important systems in question to the stress of pregnancy.

Observations of the cardiovascular-renal status have been recorded throughout pregnancy and in a special follow-up clinic in which patients have been studied from six weeks to six years postpartum. We have attempted by careful questioning and frequent physical examinations to gain an insight into the natural history of this disorder, its background, earliest manifestations, and development in relation to environmental changes.

Records of prepregancy observations of these patients have been secured where possible from physicians and hospitals. Some patients have been studied through several pregnancies. In most cases, however, we lacked accurate prepregnancy data.

CLASSIFICATION

In our description of the toxemias that seem to affect chiefly the cardiovascular system or the kidney, we have used leading clinical features as the basis of classification. Three clinical forms are thus dealt with.

The first may be called the acute convulsive or eclamptic toxemia; the second, nephritic toxemia; the third, the hypertensive or cardiovascular toxemia. These have many symptoms in common. Headache, visual disturbances, vertigo, vomiting, changed mental states, epigastric pain, jaundice, even convulsions may be present in any type. Hypertension, albuminuria, oliguria, edema, retinal changes may also be found in each. Differentiation depends more upon the severity and time of appearance of certain symptoms than upon their mere presence.

Under convulsive toxemias are grouped all cases which had convulsions. Under the heading nephritic toxemias are placed cases with prolonged and marked albuminuria, or with a nonprotein nitrogen of 40.0 mg. per cent or more in the circulating blood. The remaining cases we speak of as the hypertensive or cardiovascular toxemias. These have hypertension without convulsions and without nitrogen retention or marked and prolonged albuminuria. We have found that examples of essential hypertension existing before pregnancy exhibit this type of toxemia during pregnancy almost without fail. The course of this toxemia during pregnancy and in the follow-up indicates its probable identity with essential hypertension, hyperpiesis or hypertensive cardiovascular disease. That childbearing can reveal essential hypertension when that disorder is latent and aggravate it when it is actively present is a fact that should be recognized by every obstetrician and every internist. The hypertensive and nephritic forms of toxemia are closely related. The difference in their course and prognosis for both mother and child, however, makes their separation desirable on clinical grounds.

This report deals with all cases studied in the follow-up clinic for toxic cases and represents unselected material.

Acute Convulsive Toxemia: Eclampsia.—In eclamptic cases of the convulsive type treated at the Sloane Hospital in the last five years, the maternal mortality was 14 per cent. The fetal mortality was 55 per cent for all cases, 72 per cent for the antepartum cases. It is expected that the routine use of intravenous magnesium sulphate will bring down both maternal and fetal mortality and avert convulsions in many preeclamptic patients.

The pathologic changes are degenerative rather than inflammatory. They are distinctive in the liver, less so in the kidney and the other parenchyma. In this clinical report they need not be given.

Fifty-six cases of convulsive toxemia have been studied. As these are all our cases which had convulsions, they include a few cases in which there was previous chronic cardiovascular disease or nephritis. They should ideally be grouped as (1) acute eclampsia, (2) chronic cardiovascular-renal disease with superimposed eclampsia, and (3) uremia.* Clinically, it has been impossible to make these distinctions consistently; histories of emergency patients have been unsatisfactory and necropsy material scant. All convulsive cases are, therefore, studied here as a single group. Similarly, the cases often described as preeclamptic, i.e., in which convulsions which seemed impending did not actually occur, are not separately treated. Some of the results may be summarized.

I. STATISTICAL STUDY OF CASES OF CONVULSIVE TOXEMIA

Blood Pressure.—This was recorded in 56 cases. Hypertension was observed in all but two. In two more the systolic blood pressure did not go above 140. The minimum pressure was 130/70; the maximum 288/190. The average systolic pressure in all cases was 185 mm.; the average diastolic pressure 113 mm.

The Heart.—The size of the heart was recorded in 37 cases. Of these 46 per cent showed an apex 4 inches or more from the midsternum. In 54 per cent the point of maximum impulse was mesial to this.

II. RETINAL CHANGES

Ophthalmoscopic examinations were recorded in 37 cases. Of these, 65 per cent showed changes of the type already specified. In the remainder the fundus was normal. Among the 24 cases with noticeable alterations in the retinal picture, 22 had edema, 15 changes in the vessels, 12 exudate, 11 hemorrhages, 4 pigmentation, 2 detachment of the retina.

The most characteristic as well as the earliest change is a diffuse edema of the retina. This often precedes by several days the other features listed. Spasticity of vessels, hemorrhage, exudate and pigmentation usually mark the later states of the disturbance.

III. EDEMA

In 40 cases there is record in respect to edema. Edema was present in 32 or 78 per cent; absent in 9 or 22 per cent.

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*Stander, H. J., and Peckham, C. H., AM. JOUR. OBST. AND GYNEC., 1926, xi, 583.

Table I. Convulsive Toxemia

SUBSTANCE	NO. CASES	MAXIMUM	MINIMUM	AVERAGE
Nonprotein Nitrogen	46	173. mg.	20.2 mg.	39.7 mg.
Uric Acid	44	13.7 mg.	1.8 mg.	6.2 mg.
Chlorides (plasma)	17	780. mg.	526. mg.	605. mg
Calcium	19	10.6 mg.	7.5 mg.	8.8 mg.
Cholesterol	40	723. mg.	106. mg.	315. mg.
Fibrinogen	40	945. mg.	165. mg.	588. mg.
Creatinin	19	3.95 mg.	1.16 mg.	1.68 mg.

Chemistry of the Blood.—Our observations are given in Table I. Our blood chemistry records show an average increase in the uric acid, cholesterol and fibrinogen and a diminution in the calcium.

Of the 56 cases, 8 died, 4 could not be traced. Follow-up observations were made on the remaining 44. Of these 14, or 32 per cent, had persistent hypertension; 15, or 34 per cent, had some degree of albuminuria. In 17 of 28 cases (61 per cent) in which the retina was studied, definite changes of the kind already described were found. Cardiac hypertrophy was found in 14 of 37 cases (38 per cent). Thickening of the large vessels was apparent in 23 per cent. Edema was present in 4 of 41 cases observed (10 per cent).

In other words, more than one-third of these examples of eclampsia showed lasting and sometimes serious signs of disease from six weeks to six years postpartum. These changes were in the cardiovascular-renal system or the retina.

Thirteen of these cases were studied in later pregnancies. None had a repetition of eclampsia, although in one case convulsions were apparently averted by treatment with magnesium sulphate. Five pregnancies were normal. Nine were marked by toxemia. There were two premature macerated fetuses, one premature baby which died shortly after birth, and one four-months' miscarriage. One patient was curetted because of an established chronic nephritis. It is notable that in a consecutive series of 154 toxic multiparae, twenty, or 13 per cent gave a history of convulsions in previous pregnancies.

The question whether the cardiovascular and renal changes found precede and perhaps form a basis of the toxic disturbance, or whether the changes are the result of the eclampsia, cannot be decided from the data at hand. Further medical study of the prepregnancy status of the patients and new functional tests are needed. Our present impression is that many patients showing this disorder during pregnancy have latent disease which is revealed and aggravated by pregnancy.

Nephritic Toxemia.—Under this heading we have placed all nonconvulsive cases with a nonprotein nitrogen above 40 mg. per cent and all those with marked and long standing albuminuria. A background of renal disturbance in many of those arbitrarily placed in this nephritic group is suggested by the finding that 19 per cent gave history of previous renal disease while 52 per cent of the multiparae had had similar disturbances in former pregnancies.

The average age was 29.4 years. In 18 per cent there was history of scarlet fever; in 12 per cent, lues. Eighty-three per cent had poor teeth; 45 per cent had diseased tonsils. There was edema in 81 per cent; headache in 58 per cent; visual disturbances in 60 per cent; vertigo in 31 per cent.

Among the 64 cases the average systolic pressure was 196 mm., the average diastolic pressure, 113 mm. In 9, or 14 per cent, the blood pressure was not above 140 mm. systolic. It is of special interest that only 15 per cent of the cases had a blood pressure above 140 mm. on leaving the hospital two to three weeks postpartum. During a follow-up study over periods of from six months to six years postpartum, however, hypertension was found in 51 per cent of the same group. This confirms an impression that a normal or low blood pressure during the puerperium is no guarantee that hypertension will not reappear during the months or years immediately following.

During the toxemia, the apex of the heart was displaced to the left in 32 per cent of the cases. In the follow-up the corresponding figure was 54 per cent. Edema was present in 81 per cent, while in the group followed up it was found in but 4 per cent. Definite thickening of the brachial or radial arteries was found in 41 per cent of the follow-up group.

The maximum, minimum and average figures for the important chemical findings in the blood are given in Table II.

TABLE II. NEPHRITIC TOXEMIA

SUBSTANCE	NO. CASES	MAXIMUM	MINIMUM	AVERAGE
MG. PER 100 C.C.				
Nonprotein Nitrogen	50	74. mg.	16. mg.	35.2 mg.
Uric Acid	55	8.9 mg.	1.0 mg.	4.3 mg.
Chlorides	15	6.38 mg.	5.1 mg.	594. mg.
Calcium	19	11.56 mg.	7.2 mg.	9.5 mg.
Cholesterol	13	522. mg.	133. mg.	266. mg.
Fibrinogen	44	1110. mg.	325. mg.	573. mg.

As might be anticipated, the patients with nonprotein nitrogen above 40 mg. per cent made the poorest obstetric records. There were 8 such cases. Two of these mothers died within three years, one in uremia and one with pneumonia and nephritis; 6 of 8 fetuses died in utero and were born macerated; 2 were delivered living at term. Of 5 mothers studied at a follow-up clinic, all showed cardiovascular-renal disturbance.

The fetal mortality of the entire group of nephritic toxemia was 47 per cent.

Retinal examination revealed the following: diffuse edema in 40 per cent; retinal exudate, 31 per cent; hemorrhage, 34 per cent;

changes in the vessels, 53 per cent. Some deviation from the normal retinal picture was present antepartum in 66 per cent of all cases in which the retina was examined, while during the follow-up period similar changes were noted in 55 per cent of the cases.

During the toxemia these patients had varying amounts of albumin in the urine from a minimum of a very heavy trace with the heat and acid test to a urine "boiling solid." On discharge from the hospital 24 of 68 cases, or 35 per cent, had a flocculent precipitate of albumin in the urine. During the follow-up period 91 per cent of the 55 cases studied showed albuminuria. This was a flocculent precipitate in 53 per cent. The residual nephritis is very mild but may become severe in another pregnancy, in an infection or other stress.

Table III brings out the interesting point that cases who have had blood pressure of 190 mm. or over show an extremely high fetal mortality, 79 per cent, and a high incidence of lasting disease.

TABLE III. CASES OF NEPHRITIC TOXEMIA
CARDIOVASCULAR STATUS IN PREGNANCY

BLOOD PRESSURE		CARDIAC HYPERTROPHY			THICKENED LARGE ART.			RETINAL CHANGES			FETAL MORTALITY		
Blood pressure	No. cases	No. cases observed	No. c̄ hypertrophy	Per cent c̄ hypertrophy	No. cases observed	No. c̄ thickening	Per cent c̄ thickening	No. cases observed	No. c̄ changes	Per cent c̄ changes	No. cases observed	No. deaths	Per cent deaths
Under 140	9	8	1	12	4	1	25	6	2	33	9	3	33
140-189	36	33	5	15	20	7	35	17	12	70	36	12	33
190 and over	19	18	13	72	12	7	58	13	10	77	19	15	79
Total	64	59	19	32	36	15	42	36	24	66	64	30	47

The course of this type of toxemia is gradual. At times it seems not to progress but for weeks to remain at a level, with pallor, edema, hypertension and albuminuria. Accidental hemorrhage with premature separation of the placenta may occur. Some degree of anemia is the rule; 32 per cent of our series had a hemoglobin of 70 per cent or less. Ominous symptoms are visual disturbance or an increasing retinitis, which may be asymptomatic or may threaten permanent loss of sight; oliguria or anuria; retention of nonprotein nitrogen in the blood; deviation from normal mentality; epigastric pain; heightened reflex activity or convulsions. The latter are infrequent, late and are probably uremic in character. When any of these do not yield to treatment, the uterus must be emptied.

The maternal mortality in this variety of toxemia is not high.

Among our 64 cases there were no deaths in the hospital and but two in the follow-up period.

The result of repeated pregnancies in women who have shown this "nephritic" type of toxemia is a matter of importance. In our series 12 were observed in subsequent pregnancies. Of these, 5 attempts at reproduction were unsuccessful, resulting in fetal death.

TABLE IV. CASES OF NEPHRITIC TOXEMIA
CARDIOVASCULAR STATUS IN FOLLOW-UP

BLOOD PRESSURE IN PREGNANCY		CARDIAC HYPERTROPHY			THICKENED LARGE ART.			RETINAL CHANGES			HYPERTENSION			MARKED ALBUMIN		
Blood Pressure	No. cases	No. cases observed	No. c̄ hypertrophy	Per cent c̄ hypertrophy	No. cases observed	No. c̄ thickening	Per cent c̄ thickening	No. cases observed	No. c̄ changes	Per cent c̄ changes	No. cases observed	No. c̄ hypertension	Per cent c̄ hypertension	No. cases observed	No. c̄ marked albumin	Per cent c̄ marked albumin
Under 140	9	7	3	43	5	1	20	5	1	20	7	0	0	5	3	10
140-189	36	26	11	42	18	7	39	18	8	45	35	17	49	33	18	54
190 and over	19	17	13	76	11	6	54	13	11	85	15	12	80	17	8	47
Total																

In summary, then, patients showing marked and persistent albuminuria or retention of nitrogen during pregnancy, had a 50 per cent chance of fetal survival. About 60 per cent of the cases showed persistent renal or cardiovascular changes of importance during the years immediately following the pregnancy with toxic symptoms. It seems probable that pregnancy has an adverse effect upon cases of this character, reducing the factor of safety in their renal and cardiovascular systems. Therefore, repeated pregnancies are undesirable from the standpoint of maternal health and likely to be unprofitable because of the great liability to fetal death. It seems probable that an underlying chronic defect exists in these cases, a defect revealed and aggravated by the stress of reproduction.

Hypertensive Type of Toxemia of Pregnancy.—In this, the third and most common type of toxemia, the chief symptom is hypertension. Cases who have rise in blood pressure without convulsions or evidence of marked renal irritation or insufficiency have been considered separately because in course, prognosis and treatment, they differ from the eclamptic or nephritic groups.

While hypertension may precede the pregnancy, it usually appears toward the later months and becomes gradually more marked as time goes on; it is often the sole discoverable evidence of trouble. Usually, however, when a pressure of 180 mm. is reached, some degree of albuminuria appears. This may be followed by edema and oliguria, rarely by icterus and convulsions; i.e., the picture changes to that described as nephritic or convulsive toxemia. Placental separation and fetal death with later delivery of a macerated fetus often occur in the later development of this picture.

With intrauterine death of the fetus or its delivery, the blood pressure usually falls and the medical attendant is lured into a false sense of security, believing that the hypertension is at an end. Continued observation proves that many of these women will, within a few weeks or months postpartum, have a renewed rise in pressure which may be enduring. In addition, other stigmata of chronic cardiovascular disturbance may be detected. This fact has not had due recognition.

Many show cardiovascular disease early in pregnancy. Cardiac hypertrophy, thickening of brachial or radial arteries, spastic or sclerotic changes in the arteries of the retina are present in a large percentage. Of 175 cases observed antepartum, 23 per cent showed cardiac hypertrophy; 27 per cent thickening of the brachial arteries; 55 per cent changes in the vessels of the retina. Such findings suggest that many of these patients had cardiovascular changes before pregnancy.

The laboratory findings are not distinctive. In addition to the tardy albuminuria which may become extreme when matters become serious for the mother, casts may appear. In most instances the uric acid of the blood is moderately raised; urea and nonprotein nitrogen remain at their normally low point for the pregnant woman. The chlorides are not increased.

The fetal mortality was 15 per cent. There were no maternal deaths.

TABLE V. CASES OF HYPERTENSIVE TOXEMIA
CARDIOVASCULAR STATUS IN PREGNANCY

BLOOD PRESSURE		CARDIAC HYPERTROPHY			THICKENED LARGE ART.			RETINAL CHANGES			FETAL MORTALITY		
Blood Pressure	No. cases	No. cases observed	No. c̄ hypertrophy	Per cent c̄ hypertrophy	No. cases observed	No. c̄ thickening	Per cent c̄ thickening	No. cases observed	No. c̄ changes	Per cent c̄ changes	No. cases observed	No. deaths	Per cent deaths
140-149	42	42	5	12	24	6	25	16	10	62	40	2	5
150-159	50	48	6	12	30	3	10	18	7	9	49	4	9
160-169	32	29	8	28	16	3	19	14	8	57	31	6	20
170-179	18	17	4	23	13	4	33	11	4	36	17	2	12
180-189	15	14	5	36	10	6	60	8	5	62	14	4	29
190-199	5	5	1	20	—	—	—	4	3	75	5	3	60
200-200 +	13	13	11	84	9	6	66	9	7	77	12	4	33
Total	175	168	40	23	102	28	27	80	44	55	168	25	14.8

Follow-up studies of 175 cases have brought out some important facts. These patients were observed at intervals varying from six weeks to six years postpartum, the average follow-up period being about two years. Of these, 40 per cent showed blood pressures above 140 mm. In general the percentage of those showing hypertension postpartum was larger among those having the higher blood pressure during pregnancy.

TABLE VI. CASES OF HYPERTENSIVE TOXEMIA
CARDIOVASCULAR STATUS IN FOLLOW-UP

BLOOD PRESSURE IN PREGNANCY		HYPERTENSION			CARDIAC HYPERTR.			THICKENED LARGE ART.			RETINAL CHANGES			SUMMARY ANY CHANGES		
Blood Pressure	No. cases	No. cases observed	No. c̄ hypertension	Per cent c̄ hypertension	No. cases observed	No. c̄ hypertrophy	Per cent c̄ hypertrophy	No. cases observed	No. c̄ thickening	Per cent c̄ thickening	No. cases observed	No. c̄ changes	Per cent c̄ changes	No. cases observed	No. abnormal	Per cent abnormal
140-149	42	41	9	22	39	16	41	84	12	35	30	17	57	42	30	71
150-159	50	50	10	20	47	14	30	38	7	18	38	21	55	50	31	62
160-169	32	30	13	43	29	13	45	24	6	25	21	12	57	32	25	80
170-179	18	18	11	61	16	3	19	14	9	64	10	6	60	18	15	83
180-189	15	15	9	60	13	6	46	12	6	50	12	9	75	15	12	80
190-199	5	5	4	80	4	3	75	4	1	25	4	3	75	5	4	80
200-200 +	13	13	11	84	11	7	64	9	5	55	11	11	100	13	13	100
Total	175	172	67	40	159	62	40	135	46	34	126	79	63	175	130	74

It is of interest to note the high incidence of cardiovascular changes (71 per cent) in the group of cases with pressures only slightly above the normal.

Sixty-three of these patients who have recently gone through pregnancies with this type of toxemia have been observed in this hospital in one or more preceding or subsequent pregnancies. The number of the pregnancies observed here has varied from two to six per patient and the period of years over which their records extend varies from two to twenty-three. Thirty-three of these women have been observed during pregnancies over a period of more than five years and fourteen of them over a period of more than ten years. It has, therefore, been possible to estimate whether a woman who has once suffered this type of toxemia is liable to develop it in subsequent pregnancies.

Eleven of the sixty-three cases showed hypertension only in the last of a series of pregnancies, and it is still to be observed how they will react in the future. Fifty-two of them, however, were observed in pregnancies subsequent to the one in which they first developed toxemia, and of these, fifty, or 96 per cent, had a recurrence of some grade of hypertension. In 21 of these cases there was a tendency for the disease to become more severe; in 16, the blood pressure reached about the same figures; while in only 6 was the blood pressure progressively lower in the later pregnancies. Of 44 of the 63 patients observed in follow-up when not pregnant, 27, or 61 per cent, had blood pressure above 140. Of the 50 patients who had hypertension in two or more pregnancies, 27 were seen in follow-up, and of these, 21, or 78 per cent, had blood pressure above 140. These data indicate that a woman who has once exhibited hypertension in pregnancy is liable in subsequent pregnancies to show a similar or more advanced disturbance, and that as pregnancies are repeated, she tends to maintain a hypertension in the nonpregnant state as well.

Of the total 230 pregnancies carried five or more months by this group of women, 34, or 15 per cent, ended as stillbirths. One woman had eight and another five stillbirths; if we except these, and five others presumably referable to syphilis, we have 16, or 7.0 per cent, for the remaining women. This incidence is lower than that for our series in whom evidences of renal disturbance were present.

Again, in women with hypertensive cardiovascular disease antedating pregnancy, it can be predicted with great precision that toxic symptoms will occur and become increasingly severe during the later months. Very few women who begin pregnancy with blood pressures above 150 systolic or 100 diastolic can go through pregnancy successfully; that is, with a living child. It is our opinion, moreover, that pregnancy does much to accelerate the progress of chronic cardiovascular disease, that it may bring it out when latent, and is to be avoided when the disorder has made evident inroads.

Treatment.—Although apart from the chief object of this paper, a résumé of our experience in the medical treatment of these types of toxemia of pregnancy may be helpful. Most important is prevention. Among the clientele of a good antenatal clinic, the acute forms of toxemia are very rare. Attention to diet, to the patient's weight, her digestion and excretion, the elimination of nervous and mental strain, the care of foci of infection, the treatment of defects in the endocrine glands when possible—these are of great importance in warding off toxemia.

The general treatment of all forms of toxemia described includes the following: Mental and physical rest are enforced. The diet is low in protein and salt and contains a large amount of carbohydrate and an ordinary amount of fat. Elimination is encouraged by bowel and skin. When needed, relaxation is secured by sedatives. The most reliable of these are the bromides, chloral, paraldehyde, morphine and sulphate of magnesia. If convulsions occur, or if restlessness, mental aberration or increased activity of the deep reflexes seem to indicate that they impend, an intravenous injection of magnesium sulphate, 25 c.c. of a 10 per cent solution, should be given.

This is usually followed by a cessation of the convulsion, relaxation, a lowering of blood pressure and diuresis. Prompt relief of headache often occurs. This measure can be repeated frequently if there is need. Given slowly there is little danger of collapse. If magnesium sulphate is not available, morphine in large amounts is well tolerated.

In acute convulsive toxemia, attempts to hasten delivery of the fetus by mechanical interference are usually unwise. These place an extra burden on the mother at a time when such is ill borne. The object of treatment is the control of convulsions until a spontaneous delivery takes place. Barring obstetric obstacles, this is to be looked for.

Since eclampsia is not likely to recur in later pregnancies, it need not discourage future attempts at childbearing. The patient should be observed in the interval, however, for signs of chronic cardiovascular disease.

The *management of the nephritic type of toxemia* is that of an acute or subacute nephritis plus pregnancy. Often the patient can be carried along until viability or term despite hypertesion, edema and ried along until viability or term despite hypertension, edema and albuminuria. In the presence of unyielding nephritis, the uterus should be emptied as soon after viability of the fetus as seems wise; without any delay and without regard for the fetus if the mother's symptoms are serious. The unfortunate result of later pregnancies in women who react in this way to childbearing has already been discussed.

The hypertensive type of toxemia is slow in development and seldom offers an emergency. The problem is that of the management of hypertensive cardiovascular disease and pregnancy. Chloral hydrate is valuable in bringing about relaxation and can be used freely over long periods.

The fetus is comparatively safe during the earlier part of the toxemia. If the pressure rises above 180 mm. and if there is also notable albuminuria, there is great danger of fetal death. This danger seems increased in mothers with well-marked changes in the general cardiovascular field. In conditions such as these, early induction of labor may be considered.

Women with persistent systolic pressure above 150, and diastolic pressure above 100, at the beginning of pregnancy are not likely to go through pregnancy successfully. This is particularly the case when changes in the retinal vessels give hint of a probable "arteriocapillary fibrosis." In such, abortion is usually wise, since it spares the maternal cardiovascular system the certain damage of pregnancy. If the woman is so eager for offspring as to be willing to pay the price and run the risk of an unsuccessful pregnancy, she may be encouraged to carry on if the vascular changes are not too well marked. Rest in bed for weeks or months may be required. As a rare exception, a woman with pressures approaching 200 and with corresponding arterial changes will bear a normal child even after previous failure.

Discussion.—Can any conclusions be drawn as to the general nature of the toxemias of pregnancy? None that are more than tentative; few that have support more firm than that of impression and opinion. The result of seven years of clinical study of these conditions is the impression that there are two great classes of toxemia of pregnancy. The first includes pernicious vomiting and acute yellow atrophy of the liver; the second includes the eclamptic, nephritic and hypertensive forms of toxemia which we have discussed. These last three seem allied in many respects. The majority of women with these disturbances have a peculiar bodily habitus. They are large, overweight, with heavy muscles, thick skin, large features, with hands of a broad, square pattern, not infrequently a masculine crines and spaced incisor teeth.

Draper, in an anthropometric study of 117 of our cases, found that the dominant type among them indicated past activity of the anterior lobe of the pituitary gland, in other words, acromegaly. There is a common symptomatology and similar pathologic changes appear in the cardiovascular-renal field during the follow-up period. Clinical study thus far seems to point to a common source of these disturbances.

It is our belief that search for a single cause like a toxin may continue to end in failure. There is promise that solution of the riddle of the toxemias of pregnancy may be found by study along less narrow lines. Such study must include knowledge of the type of woman who reacts thus adversely to the strain of reproduction and a detailed study of her functional and structural deficiencies, both before and after childbearing. We are convinced that defects of importance can be uncovered in a majority of women who have or who have recently had a toxemia of pregnancy. The defects which are most common and the easiest to show are in the cardiovascular-renal field. We believe that a large proportion of these women have an underlying disease which is brought to light or aggravated by pregnancy. We believe that it is possible to predict with considerable accuracy the reaction to pregnancy of such women. It is our opinion that observations on these so-called toxemias of pregnancy have bearing upon the general problem of the cardiovascular-renal diseases.

SUMMARY AND CONCLUSIONS

The late toxemias of pregnancy represent failure of a defective maternal cardiovascular-renal system to adapt itself to the strain of childbearing. They interest the medical practitioner as early examples of disorder in this system and also as indicators of latent weakness which will reappear in later life.

Two hundred and ninety-one cases were studied at the Sloane Hospital for Women. They are classified as (1) acute convulsive toxemias, (2) nephritic toxemias, marked by long-continued albuminuria or relative nitrogen retention, and (3) hypertensive toxemias, a group of cases characterized by hypertension without marked albuminuria and set apart because of its resemblance to "essential hypertension."

The cases were studied with special reference to the cardiovascular-renal status in the antepartum clinic and wards and later in a follow-up clinic over periods varying from six weeks to six years postpartum. The tabulated observations show that cardiac hypertrophy, thickening of the brachial and radial arteries and certain eye-ground changes were present in a large proportion of these cases during the toxemia (this suggests that some disorder antedated pregnancy) and also during the follow-up period. Hypertension persisting for months or years was found in one-third of the cases of eclampsia, one-half of the cases of nephritic toxemia and two-fifths of the cases of hypertensive toxemia. One-half of the nephritic group showed marked albuminuria in the follow-up period.

Fetal mortality in the eclamptic group was 55 per cent, in the nephritic group 47 per cent, and in the hypertensive group 15 per cent.

Both the fetal mortality and the later incidence of signs of persistent disease were greater in those cases showing the higher blood pressure readings during pregnancy.

These types of toxemia are, therefore, not mere complications of pregnancy. It is probable that pregnancy reveals rather than causes the disease. The behavior of a woman's cardiovascular-renal system in pregnancy gives to the physician a valuable hint as to what may be expected of it under subsequent stresses and strains.

Search for a single toxin as the cause of these toxemias may continue to be fruitless. Much may be learned, however, by a broad study of the woman who makes this abnormal response to pregnancy.

49 EAST FIFTY-THIRD STREET.

A CASE OF HUMAN CYCLOPIA RESEMBLING ANOPHTHALMIA

By Carl Bachman, M.D., Philadelphia, Pa.

(From the Obstetric Clinic of Dr. Barton Cooke Hirst, Hospital of the University of Pennsylvania)

RECENT literature contains few case reports either of anophthalmia or of human cyclopian monsters. With cyclopia, this may be due to cases being seen and not reported, since Hannover's[7] tabulation of 109 cases in 1882 has shown it to be a comparatively frequent type of monstrosity in man. The artificial production of these monsters in lower orders has likewise been frequently accomplished by teratologists.[15] There are interesting features in the case which I wish to report, making it desirable to record the data obtained despite omissions due to failure to secure a postmortem pathologic examination.

The maternal history is given in detail in order to present all the facts for their possible etiologic significance.

Mrs. A. H., housewife, aged 21, Jewish, was registered at the Pre-Natal Clinic of the University Hospital May 14, 1926.

Clinical History.—Had been healthy all her life except for a mild varicella as a child in Russia, and scarlatina at ten years of age. Family history, as also that of her husband, contained no instances of monstrosities or idiocy. Husband healthy and an abstainer from alcoholic liquors.

Obstetric History.—Married eighteen months. Had one spontaneous miscarriage at four months, fifteen months ago, requiring hospitalization and evacuation of the uterus with placental forceps.

Present Pregnancy.—Last normal menstrual period July 27, 1925. The patient then had a "one-day period" September 19, 1925, but noted none of the subjective phenomena of early pregnancy either before or immediately following this. Had no nausea, and failed to note the date of the first fetal movements. Had been feeling well.

First examination: Weight 138 pounds. General appearance of good health; sluggish mentality. Blood pressure, 130 systolic; 80 diastolic. Fundus uteri soft and cystic, extending about 4 cm. above the umbilicus; excess of amniotic fluid suggested. Fetus small, head down and entering pelvis; back to left, fetal heart sounds below and to the left of the umbilicus. Placental bruit not noted. Pelvic measurements above normal limits, and vaginal examination negative for abnormal features. In view of these findings term was calculated from the September "period," and was expected June 26, 1926.

The patient made one more prenatal visit on June 2, at which time the fundus was about 6 cm. above the umbilicus. The increased amount of amniotic fluid made the diagnosis of fetal position less certain at this time, but the head was well into the pelvis. The patient was feeling well. Urinalysis and blood Wassermann were negative.

Labor progressed normally and delivery occurred rapidly and spontaneously, with the occiput emerging anteriorly. The cord was beating normally. No anomalies of labor were noted; there was no evidence of a low placentation, and routine examination of the cord and placenta disclosed no abnormalities or gross infarcts. The child breathed immediately, although with obvious difficulty, and with an obstructive type of dyspnea due in part to a curtain-like flapping of the upper lip during respiration. Cyanosis was marked.

The puerperium was entirely without event. The child lived nine hours, supported mainly by continuous oxygen feeding and various stimulants. During this time respirations were regularly and properly timed, although extremely labored. Cyanosis persisted. There was no suggestion of intracranial or medullary hemorrhage, and careful examination failed to disclose pulmonary atelectasis or other cause for the cyanosis. The obstructive type of dyspnea was obvious, but the obstruction interposed by the upper lip was also obviously not the sole cause of the difficulty.

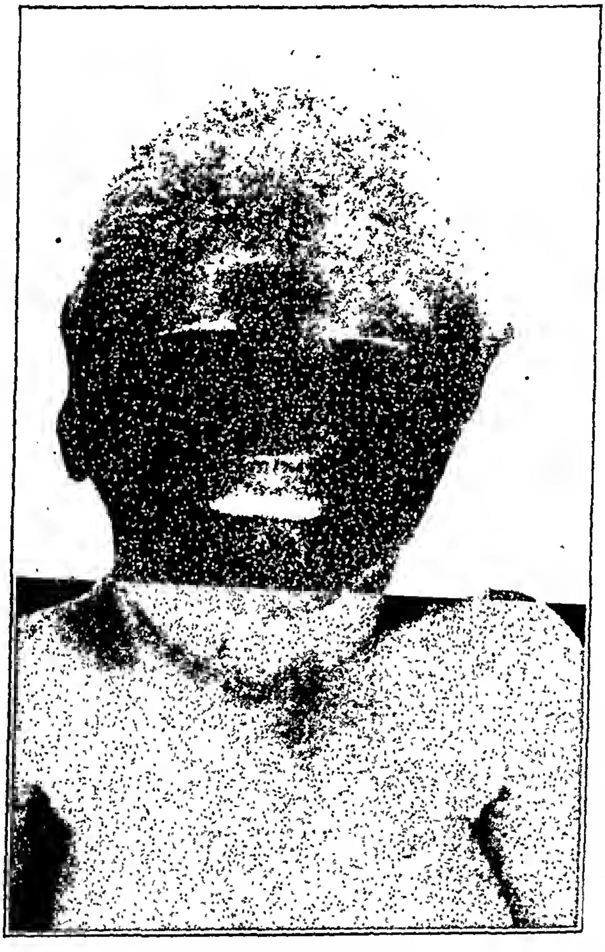

Fig. 1.—Case of human cyclopia. Full face view shows incomplete descent and separation of the orbits, corresponding to faulty development of the frontonasal process. The result is a long nose, with the septum not united with the floor of the nares (maxillary processes), and the face as a whole suggesting the features of adult maturity. The orbits are shallow, and the eyeballs are missing to gross examination. There is but one median nostril.

Description of Specimen.—Owing to the precarious state of the child's health, incidental observations of its deformity were necessarily limited during life. Necropsy or preservation of the body was strenuously refused.

Weight, 2670 gm. Estimated length of gestation about eight months. The neck, trunk and extremities appear to be everywhere fully developed and practically mature. The skin is smooth and shiny, and covered with lanugo. The cranial bones are firm and closely apposed along the sutures. The hair of the head is from 2 to 3 cm. in length. The nails of the fingers and toes project beyond the digits.

The head is not disproportionately small except for an obvious contraction of the frontooccipital diameter. Symmetery is present throughout. The anterior fontanelle measures less than 2 by 3 cm. The striking features of the face are the relatively high situation of the orbits, and their close approximation, giving the appearance of adult maturity. The nose is correspondingly longer than normal, the extra length being apportioned half between bone and cartilage, the latter hanging rather loosely from the bony bridge. The nose terminates below in a single, median nostril, about 4 mm. in diameter, flanked by flattened alae. Specular examination of the nares discloses no union of septum with floor. The superior maxillae are firmly united in the midline, as are also the bony palatal processes, although the latter are ridged longitudinally, parallel to the alveolar processes. The eyelids are tightly closed but not fused. The eyelashes are normally formed. The orbits are extremely shallow, and eyeballs can neither be palpated against the bony orbits, nor demonstrated by prying open the eyelids. The conjunctival sacs appear to be lined by mucous membrane, which at the time of death has thrown off a thick mucoid secretion.

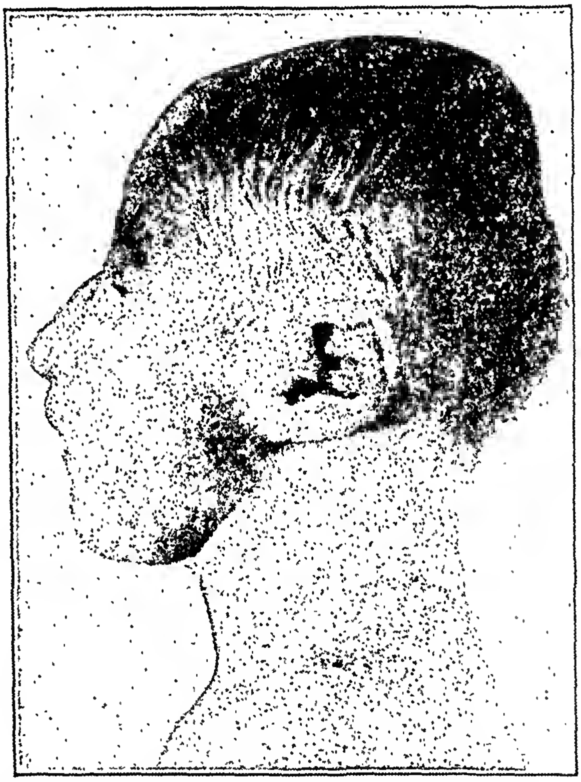

Fig. 2.—Case of human cyclopia. Profile is that of an adult. Diminished fronto-occipital diameter, due to shallowness of anterior fossa of the skull.

The spine, anus and genitalia appear normal.

Roentenograms.—The outstanding features are: The shallowness of the anterior fossa of the skull, and the elevation, approximation and shallowness of the orbits. The superior maxillae appear to be fully and normally developed. The antra and the bony septum of the nose are present. The remainder of the skeleton is normally developed, although there is increased condensation of all long bones.

Cord Wassermann.—Negative.

COMMENT

An interesting speculation arises in accounting for this specimen either as an example of anophthalmia or as a variant of the group of cyclopian monsters. Popular conception pictures cyclops in the more classical and spectacular form of a single median-eyed individual, whereas the teratologists have shown this type of monstrosity to embrace many grades of incomplete duplicity of the eyes.

A difficulty is the lack of data, which a postmortem examination would have supplied, concerning the state of the visual apparatus within the skull, and the condition of the frontal lobes and lateral ventricles of the brain, and the floor of the anterior fossa. The literature contains records of total congenital absence of the visual apparatus, without associated changes in the orbits or other derivatives of the primitive frontonasal and maxillary processes, the ultimate form of which is believed to be dependent upon the primary development of the optic "anlage."[8] Unfortunately such reports are mainly neurologic studies, and observations bearing upon the possible teratologic relationship of anophthalmia to cyclopia are wanting. Both Spiller's[14] case and the case of Haab, quoted by Spiller, lived a number of years exhibiting other abnormalities, chiefly peripheral spasticities referable to the central nervous system, but without deformity of the frontal lobes, the face, or anterior portion of the skull. It is possible that some of these cases represent the result of regressive or atrophic processes in the retina and optic tracts, from syphilitic or other intrauterine disease occurring at a later date in embryonic life that the extremely early periods ascribed to the "developmental arrests"[3, 8, 11] responsible for cyclopia.

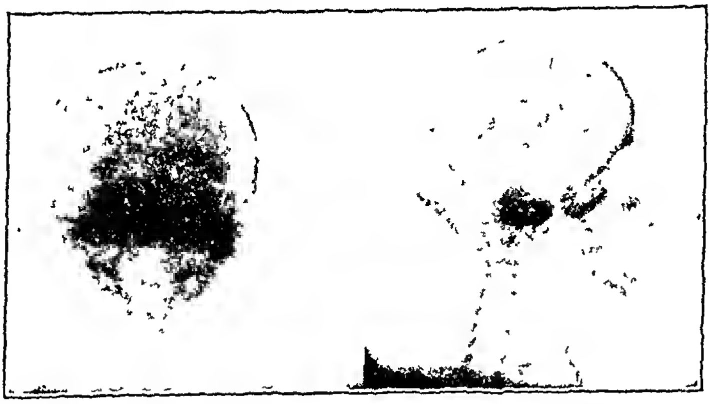

Fig. 3.—Case of human cyclopia. The roentgenologic features are (1) shallowness of the anterior fossa of the skull, and (2) elevation, approximation and shallowness of the orbits.

On the other hand, the examples of cyclopia described in humans[2, 8, 11] and those produced experimentally in lower orders[15] seem to present more or less mature vestiges of the whole visual apparatus, whatever the variety or degree of duplicity or unity within the system, thus indicating early perversion of development rather than secondary decay. Around the defective visual organs the "nonocular" material is vested, taking form according to the degree of separation of the various structures of the eye, the frontonasal process descending in a general way in proportion to the degree of this separation. True human cyclopian monsters apparently do not survive.

The possible varieties of cyclopia are therefore legion. The attempt of Saint-Hilaire in 1832[12, 13] to establish five "species" in the human was followed by more elastic schemes proposed in 1880 by Ahlfeld[1] and in 1900 by Bock;[9] it is not unlikely the numerous variants suggested by modern experimental work renders inadequate all subdivisions within the general class or group "Cyclopia." The specimen described is believed to belong to this group of beings, despite the fact that the defects are apparently minimal, and might be consistent with a viable and deformed, rather than monstrous, individual. It approximates very closely the first type described by Bock, the case of Hecker and Buhl illustrated by Hirst and Piersol,[10] and Saint-Hilaire's "Cebocephalus" of which only six instances were recorded prior to 1885 according to Dareste.[5]

The literature of cyclopia has been amply compiled in the more recent reviews included in the appended references.

REFERENCES

(1) *Ahlfeld, J. F.:* Die Missbildungen des Menschen, Leipsic, 1880-82. (2) *Black, D. D.:* Jour. Comp. Neurol., 1913, xxiii, 193. (3) *Chidester, F. E.:* Am. Naturalist, 1923, lvii, 496. (4) *Cleland, J.:* Jour. Anat. and Physiol., 1878, xii, 518. (5) *Dareste, C.:* Recherches sur la production artificielle des monstruosities, Paris, 1891. (6) *Dorland, W. A. N., and Hubeny, M. J.:* The X-Ray in Embryology and Obstetrics, Saint Paul, Minn., 1926. (7) *Hannover, A.:* Anencephalia, Cyclopia, Synotia, Copenhagen, 1882. (8) *Hill, E.:* Arch. Ophthal., 1920, xlix, 597. (9) Quoted by *Von Hippel, E.:* "Cyclops." Graefe-Saemisch Handbuch d. gesamt. Augenheilk., Ed. 2, Leipsic, 1900, ii, vol. 1, p. 93. (10) *Hirst, B. C., and Piersol, G. A.:* Human Monstrosities, Philadelphia, 1891-93. (11) *Mall, F. P.:* No. 15, Carnegie Institute of Washington, 1917, vi. (12) *St. Hilaire, I. G.:* Traite de Teratologie, Bruxelles, 1837. (13) *St. Hilaire, I. G.:* Histoire generale et particuliere des anomalies de l'organisation, 1832-36. (14) *Spiller, W. G.:* Contributions from the William Pepper Laboratory of Clinical Medicine, No. 3, Philadelphia, 1902. (15) *Stockard, C. R.:* Am. Jour. Anat., 1921, xxviii, 115.

CORTICAL NECROSIS OF THE KIDNEYS IN PREGNANCY

By James R. Manley, M.D., F.A.C.S., and Frank E. Kliman, Ph.C., B.A., M.D., Duluth, Minnesota

SYMMETRIC cortical necrosis of the kidneys is a rare condition. A review of the literature reveals about twenty cases in all,—some reported under the heading of degenerative nephritis, including those of Lloyd, Jardine and Teacher, Jardine and Kennedy, Rolleston, Glynn and Briggs, Carson and Rockwood and that of John C. Hirst.

Cortical necrosis is probably due to a metabolic poison associated with pregnancy. Most cases occur in the latter half of pregnancy and invariably there is a premature labor with a stillborn baby. In only one case on record was there a live birth. It may also be associated with severe late toxemias with or without an underlying nephritis.

The capsules of the kidneys strip easily. The kidneys are about one and one-half times the normal size. The surface is covered with yellowish areas, some of them markedly softened and containing purulent or caseous material according to whether secondary infection is present or not. Between the yellow areas there are small red areas due to dilated capillaries and small petechial hemorrhages. On section there are numerous yellowish streaks connecting the cortex and medulla. Necrosis and purulent infiltration is most extensive in the cortical substance.

Microscopically, the capsule is thickened and the underlying tissue stains poorly but in some areas the capsules of Bowman and the glomerular tufts can be made out clearly. The capsules of Bowman in other areas are thickened and their connective tissue cells stain poorly. Many areas throughout the cortex show diffuse coagulation necrosis. The interlobular arteries show a shedding of the endothelium, the lumen filled with blood platelets. A moderate leucocytic infiltration is present in the corticomedullary zone.

The onset is usually sudden, with no definite train of symptoms. There may be nausea, vomiting and headache. The patient is pale; puffiness of the face and swelling of the ankles may be the first signs which lead the examiner to suspect the kidneys. The temperature is usually normal unless secondary infection is present. In some cases the patient may be disoriented, with failing memory and irrationality, but usually the mind is clear until just before the end, when the patient mutters in a noisy delirium, becomes quite drowsy and fibrillary twitchings of the face and extremities occur. Definite convulsions are not the rule.

The most characteristic symptoms are the urinary changes. At first there may be nocturia followed by oliguria, and finally complete anuria. The urine is scanty, high colored and contains albumin, blood and tube casts, both hyaline and granular. The specific gravity is high, the quantity reduced and only 15-30 c.c. may be passed in twenty-four hours. On standing there is a heavy deposit. Microscopically there are a few blood corpuscles but numerous epithelial cells, pus cells, hyaline and granular casts. Albumin is abundant, forming a curdy, thick precipitate.

Edema is an early symptom, but usually not very marked. As the case progresses, effusion may take place into the pleura. The lungs become edematous. The pulse is rapid, and when the tension is increased, the aortic second sound is accentuated. The blood pressure may be very variable. It may be slightly raised or the systolic pressure may reach 200 or more.

Uremic symptoms may occur just before death. In some cases there is marked edema of the optic discs. Towards the end the breathing is the Cheyne-Stokes type. The lungs show signs of dullness over the bases and numerous coarse râles are present over the entire chest.

Blood examination shows a leucocytosis and marked reduction of the red blood cells. Creatinin and urea are increased. The CO_2 tension of the blood plasma is lowered.

The prognosis is extremely grave. Death is caused by edema of the lungs and cardiac failure, or the patient may die in convulsions.

REPORT OF CASE

Mrs. R. J. B., aged 38, primipara, was admitted to St. Mary's Hospital, December 10, 1926, in the eighth month of pregnancy, because she thought she was in labor.

She had been well during her pregnancy. Thirteen days before admission to the hospital the patient was apparently in good health and examination showed her urine and blood pressure to be normal. When admitted she was pale, suffering severe pain in the abdomen, notwithstanding a hypodermic injection of morphine and hyoscine. Her pulse was 130, and quite weak, respiration was sighing, 35 per minute, temperature 97° F. The skin was cold and clammy. Chest findings were negative. There was considerable abdominal distension. The uterus was in a state of tetanic contraction, very hard and excessively tender. Rectal examination revealed a uterus with cervix almost effaced but with no dilatation. There was no vaginal bleeding. W.B.C. 20,000. Hgb. 50 per cent. The urine was straw colored, acid, and the catheterized specimen contained four plus albumin, a moderate amount of hyaline and granular casts, a few pus clumps and a few R.B.C. At 10:30 A.M. the patient was worse, the uterus was decidedly larger and more tense. The patient was in shock with a rapid weak pulse and increased pallor. No fetal heart tones could be heard, and there was still no dilatation of the cervix. A diagnosis of concealed hemorrhage, abruptio placenta and toxemia of pregnancy with dead baby was made. On the face of the clinical findings it was decided that cesarean section was the quickest and safest way to empty the uterus.

The patient was given a 1/6 grain of morphine and hyoscine, 1/200 grain. A classical cesarean section was done in the usual manner. The uterus was found distended with blood, the placenta was detached and there was a well-marked hemorrhagic infiltration of the muscles of the uterine wall. The baby was dead but not macerated.

The patient showed signs of considerable shock at this time and was given 500 c.c. of glucose solution with insulin before leaving the table.

The patient lived 12 days after the operation. For the first few days the general condition was remarkably good. The abdominal distention subsided promptly, after the fourth day she took fluids and milk freely, also small amounts of toast, crackers, etc. From the sixth day until death she suffered from abdominal cramps associated with profuse watery bowel movements. She also had profuse sweats. She had no convulsions but was almost comatose the last three days and had twitchings of her facial muscles. There was only a slight edema of the legs and face.

She was given 500 c.c. of citrated blood intravenously four hours after the operation and almost daily intravenous injections of saline or glucose combined with insulin on a few occasions. She had several blood transfusions and on three of these occasions a nearly equal amount of the patient's blood was removed before the new blood was given. None of these measures had other than a temporary supportive effect.

Her temperature ranged from 99° to 101°. There was almost a total anuria for 12 days, the total urinary secretion for that time being only 851 c.c., or an average of about 70 c.c. per day. The urine contained a large amount of albumin and pus, with hyaline and granular casts. Her blood pressure was fairly constant at 150/78, till just before death. The leucocyte count ranged from 20,000 to 26,000, the R.B.C. 3,000,000 and the hemoglobin about 50 per cent, occasionally being higher right after a blood transfusion. The CO_2 combining power of the blood plasma was reduced to 21.4 on the fifth day. The blood chemistry showed a constantly increasing nitrogen retention. The creatinin rose from 4.8 mg. the day following the operation to 12.5 mg. the last four days before death. It did not go higher. The urea-nitrogen rose to 75 mg. and sugar to 0.187 per cent.

At autopsy the abdominal cavity contained some slightly cloudy fluid. The anterior surface of the uterus showed the recent incision with the sutures firmly in place. The serosa was very congested, glistening and small fibrinous deposits were seen around the stitches.

Upon opening the thoracic cavity both lungs, especially the right, showed extensive fibrous adhesions. There was considerable congestion and edema at the bases. A small calcareous nodule was present in one of the hilus glands. The bronchi contained considerable watery mucoid material.

The pericardial cavity contained about 10 c.c. of clear serous fluid. The heart was distended and filled with dark fluid blood. Considerable arteriosclerotic changes were present in the mitral and aortic valves. The coronary vessels showed a few yellowish patches. The myocardium was cloudy.

The spleen was quite congested and twice the normal size. The adrenals were edematous and rich in lipoids. The fallopian tubes and ovaries were somewhat edematous. One of the ovaries showed rests of a large corpus luteum. The uterus on the inside was uneven and showed necrotic areas. The liver was about normal in size and on cut surface the tissue was cloudy and showed marked central stasis. There was congestion of the pancreas. The stomach contained greenish mucous fluid and the mucosa showed numerous small hemorrhages. The intestines were thickened by an edematous infiltration.

The kidneys were about one and a half times larger than normal. The surface was studded with yellowish areas, some of them with definite purulent softening. The capsules of the kidneys stripped easily. On cut section there were numerous purulent streaks running through the medulla and cortical substances, connecting the cortex with the pelvis of the kidney. The necrosis and purulent infiltration was most extensive in the cortical substance. An area of the cortex, about 1.5 mm. thick, just beneath the capsule was better preserved. The pelves of both kidneys and ureters were filled with purulent urine.

Extensive areas of the kidney cortex were completely necrotic. The glomeruli were transformed into amorphous masses which stained irregularly with eosin. No capillaries could be recognized. The lining epithelial cells were swollen and not definitely defined. Their nuclei stained poorly and can hardly be recognized. The lumen of the tubules was narrowed by the swollen epithelial cells and many of the tubules were filled with coagulated albuminous material and a few polymorphonuclear cells. The cells of the interstitial connective tissue had lost their staining properties, and occasionally a pyknotic nucleus could be recognized. The necrotic areas of interstitial tissue were densely infiltrated with p.m.n.'s. Just beneath the capsule the cortex was not entirely necrotic but extremely congested. In some areas the glomeruli showed a beginning necrobiosis. Here the capillary loops were considerably distended and filled with red cells. In other glomeruli a proliferation of the nuclei could be seen. In this region the tubules were either empty or filled with coagulated albuminous material, hyaline or purulent casts. The interstitial connective tissue showed slight proliferation, marked edema, and often dense infiltration with diffuse hemorrhages.

The medullary substance was extremely congested. The tubuli recti were distended, most of them filled with pus.

Anatomic Diagnosis.—Endometritis, purulent pyelonephritis with cortical necrosis, cloudy swelling of kidneys, liver and myocardium, old fibrous adhesions, adhesions of the pleura, acute congestion of the spleen, dilatation of the heart, edema of the lungs.

SUMMARY AND CONCLUSIONS

1. Patient a primipara, eight months' pregnant, apparently in good health until the sudden onset of the disease.

2. The case was complicated by a concealed hemorrhage, caused by the toxemia.

3. Cesarean section was done in hopes of saving the mother.

4. Patient looked and felt remarkably well considering that there was almost a total anuria for twelve days with only 831 c.c of urine passed during this period.

5. It is surprising that the creatinin and urea in the blood were not higher considering the small amount of functioning kidney substance found at autopsy. This may be due to the fact that the patient's blood was replaced from time to time with new blood and saline.

6. Autopsy findings were characteristic of cortical necrosis except that in our case an ascending infection changed the kidney picture slightly.

7. It appears that the kidney injury was most likely due to toxic products formed from the dead fetus.

8. The disease is similar in many respects to, but is entirely different from, eclampsia.

REFERENCES

Jardine, R., and Kennedy, A. M.: Lancet, London, 1920, xi, 116-121. *Hirst, John C.:* Am. Jour. Obst. and Gynec., 1926, xii, 673-683. *Jardine and Teacher:* Jour. Path and Bact., 1910, xv, 137. *Rolleston, H. D.:* Lancet, 1911, i, 99. *Carson, William, J., and Rockwood, Reed:* Arch. Path., 1926, i, No. 6, pp. 889-893.

500 Fidelity Building.

THE EVALUATION OF METHODS IN OBSTETRIC ANALGESIA AND ANESTHESIA: WITH SPECIAL REFERENCE TO GAS-OXYGEN*

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THE desirability of pain relief in labor is no longer a matter of discussion. Severe pain is not essential to childbirth and it is the duty of the obstetrician to give the maximum relief which may be obtained without sacrificing the safety of mother or infant. Satisfactory relief is usually possible, but it requires a careful study of the individual case and frequently an adaptation of various methods to the needs of the woman during the different stages of labor. Measures for pain relief must be divided into those which are applicable in the first stage and those which may be used during the second stage. Standardization is desirable but impracticable except in so far as a general plan may be followed. Here, as in other surgery, teamwork is essential to success.

FIRST STAGE ANALGESIA

Labor always varies to some extent, and no two women will react in exactly the same manner. Normally there should be little or no pain until near the end of the first stage and, therefore, no occasion for the use of any anesthetic agent. The women in this group may require hypodermic medication for sleep in the effort to prevent fatigue and nervous wear and tear. A considerable percentage of women, however, suffer more or less during the period of cervical effacement and dilatation and relief is needed. This may be accomplished in most cases by hypodermic medication. The dosage must vary with the type and frequency of the contractions and the degree of dilatation. Heroin gr. 1/12 or pantopon gr. 1/3 and hyoscin gr. 1/100 is prepared in the syringe. If early in labor with pain moderate and contractions short only half of the dose is injected, the rest being given when needed. A severe labor requires the full dose and must occasionally be supplemented by an inhalation anesthetic or the colonic instillation of ether-oil. Long labors with an abnormal position of the head or a long rigid cervix frequently require additional hypodermics. In such cases a reduced dosage is administered. I usually order heroin gr. $\frac{1}{24}$ and hyosin gr. $\frac{1}{300}$, later repeating if necessary. Recognizing that the combination of an opiate with hyoscin may interfere with respiratory efforts of the child at birth, one should try to avoid hypodermic medication during the last two hours of labor. I am in complete accord with Williams who states that, in his experience, heroin is vastly superior to morphine in its analgesic effect, and it possesses the additional advantage in that it does not decrease the intensity of the uterine contractions and has no deleterious effects on the child. Unlike morphine, heroin is not a respiratory depressant. When our present supply of heroin is gone pantopon will be used, but I believe it a rather poor substitute.

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Inhalation anesthetics may be administered intermittently for long periods of time. I have on several occasions used intermittent nitrous-oxide-oxygen analgesia for as long as fifteen hours. Protheroe Smith used chloroform analgesia for as long as twenty-eight and one-half hours, and in at least one case Simpson gave it more than thirteen hours. Both chloroform and ether slow up labor more than nitrous oxide or ethylene. In a paper presented ten years ago I brought forward experimental evidence that even small amounts of chloroform administered with oxygen may cause marked fatty degeneration in the livers of the newborn. It would seem that chloroform could be discarded in present day hospital practice, and that in most instances ether could replace it in the home delivery. Ether, unless contraindicated, is the inhalation anesthetic of choice if the labor is tetanic, as it lengthens the interval and shortens the duration of the contraction. The chief advantage of the colonic ether-oil over inhaled ether is that the action is continuous over a considerable period of time. Its physiologic action is unchanged. It has been demonstrated at the New York Lying-In Hospital that when the quinine is left out of the Gwathmey combination there is definite second stage and perineal delay (Harrar). Harrar's report on 5800 cases shows that quinine in sufficient dosage will overcome the tendency of ether to slow up or stop labor, and if it may be accepted that there is no definite risk from the quinine, the Gwathmey ether-quinine-oil combination may prove a valuable adjunct to hypodermic medication in long hard labors. When quinine has been used to induce labor, however, there may be a definite risk to the baby if more is added to the ether-oil. Ether-oil is contraindicated in patients with kidney trouble and when there is a history suggestive of an irritable colon or colitis.

The dose of morphine used in the so-called synergistic analgesia is as great as was used in "twilight sleep." Pharmacologists question the value of adding the magnesium sulphate, and the carefully controlled animal experiments of Beckman indicate that it is better to omit it.

SECOND STAGE ANALGESIA AND ANESTHESIA

The pain of the second stage is usually controlled in part by the anesthetic agents which have been administered during the first stage. With the heroin-hyoscin combination many patients do not require an inhalation anesthetic except for a few minutes during the perineal stage. My patients are taken to the delivery room late in the first stage or early in the second stage of labor. This makes it possible to start inhalation analgesia when needed and conditions are favorable for a quick delivery should this become necessary. For second stage intermittent analgesia nitrous oxide or ethylene with oxygen has proved of the greatest value. Ethylene is the more powerful and while it is more inclined to slow up labor it has been used almost exclusively in the delivery room at Columbia Hospital during the past two years.

The technic of administering gas-oxygen analgesia to an obstetric patient is simple, being based on the principle of "beating the pain to it." A sufficient quantity of the gas must be inhaled at the beginning of the contraction to produce analgesia or the patient will experience pain and carry the memory of it even though she may be completely anesthetised during the latter part of the contraction. Success or failure in the administration of an intermittent obstetric analgesia hinges on an appreciation of this fact. Many expert surgical anesthetists are complete failures in the delivery room because they are not interested in the obstetric problem and do not cooperate. The patient should get the anesthetic agent with the first inspiration after a contraction starts and it should be continued for a sufficient number of inhalations to relieve the pain of that contraction. The number varies with the susceptibility of the patient, and the type and duration of the contraction, as well as the anesthetic employed.

The anesthetic is administered continuously during the delivery of the head, and the patient should be unconscious at this time. Her expulsive efforts are replaced by the Kristellar maneuver, i.e., pressure on the fundus. As soon as the head is delivered the gas-oxygen mixture is replaced by pure oxygen, which is continued until the cord is tied.

Perineal repair may be accomplished satisfactorily with any of the inhalation anesthetics. There is no serious objection to the use of ether at this time if pituitrin is used to contract the uterus, although it is generally recognized that ether relaxes the uterus and thereby increases the loss of blood. There is comparatively little bleeding as a rule when nitrous oxide is used. It is believed that there is a slight increase with ethylene but less than with ether. Conservation of blood during a delivery undoubtedly lessens the chances of sepsis and favors a smooth convalescence. When gas oxygen has been used for the delivery it seems better to continue with it for the repair as the administration of ether would save very little in cost and it might cause considerable nausea.

OPERATIVE OBSTETRICS

Nitrous oxide and oxygen may be administered for all operative deliveries with the exception of version. During a version complete relaxation is essential to safety and ethylene-oxygen or ether is required. For this operation ethylene-oxygen seems to have all the advantages claimed for chloroform without its dangers. A nitrous oxide-ether-oxygen combination may be used.

Most forceps deliveries may be accomplished with more or less intermittent gas-oxygen analgesia. The patient may be anesthetised while the blades are applied and thereafter be kept under analgesia so that she can bear down when traction is made on the forceps. Safety in the use of forceps is dependent largely on the use of the instrument to guide the head rather than to pull it. I rarely use more than a few pounds traction, and try to accomplish the delivery through Kristellar pressure and the patient's expulsive efforts. Gas is more adaptable to this technic than ether because of the rapidity with which the depth of analgesia and anesthesia may be varied.

Nitrous oxide-oxygen is not satisfactory as a rule for cesarean section unless combined with local anesthesia or ether. When ethylene oxygen is used it is rarely necessary to add any ether. Cesarean section may be performed satisfactorily with local anesthesia.

SACRAL AND SPINAL ANESTHESIA

Pregnancy and labor are at times made unusually dangerous because of certain problems which arise from pulmonary, renal or cardiac complications, alone or combined with a severe toxemia of pregnancy. There are patients who cannot take any of the inhalation anesthetics. While a great deal of relief may be given by the use of hypodermic medication such as heroin and hyoscin, additional relief is needed at the time of delivery. The perineal injection of local anesthetics is not sufficient and we must turn to spinal or sacral anesthesia. The results thus far reported from spinal anesthesia show that it is far more dangerous than the sacral or caudal and no more satisfactory for obstetric use. Bonar and Meeker in 1923 reported very satisfactory results with various types of sacral nerve block. Their results have been confirmed by Lundy and others.

NITROUS OXIDE VERSUS ETHYLENE

Evaluation of anesthetic agents is only possible from a comparison of experimental and clinical observations. In 1917, I reported a comparative study of various inhalation anesthetics. The animal experiments were repeated in 1924 with ethylene-oxygen. The same anesthetic chamber was used and other conditions were similar. Eleven pregnant guinea pigs and three rabbits were anesthetised for periods varying from one to five hours. It was found that an even anesthesia is more easily obtained with ethylene-oxygen than with nitrous oxide-oxygen. In this experiment none of the animals went bad during an anesthetic. When groups of guinea pigs or rabbits are deeply anesthetised with nitrous oxide-oxygen it is frequently necessary to take out one for resuscitation and an occasional animal will die suddenly. It is apparently possible to asphyxiate the young in utero without killing the mother with ethylene-oxygen just as it is with nitrous oxide-oxygen. All anesthetics undoubtedly reduce the oxygen carrying power of the blood to some degree and this must be kept in mind when there is evidence of fetal asphyxiation from a prolonged or tetanic labor. Here the advantage appears to be with ethylene since anesthesia may be obtained with a mixture containing a higher percentage of oxygen. Tissue changes following protracted ethylene-oxygen anesthesia are suggestive of slight cell edema. No evidence of fatty changes or cell destruction could be found.

My experience with nitrous oxide-oxygen in obstetrics dates back to 1909, and ethylene has only been used since 1923. Following an explosion in 1924, the use of ethylene was not permitted in Columbia Hospital until the Spring of 1925. During the past two years it has gradually replaced other anesthetics in the delivery room and to a considerable degree in the operating rooms. Since May, 1925, it has been used for 580 deliveries. The average time of administration was sixty-three minutes. The average cost to the patient was about $12.00, with a minimum of $8.00 and a maximum of $25.00. The anesthetist's report for the year 1926 showed a total of 1526 anesthetics administered to 352 obstetric patients, 483 major surgical cases, and 691 minor surgical cases. The anesthetics used are shown in the following table:

Ethylene-oxygen anesthetics	921
Ethylene-oxygen-ether anesthetics	139
Nitrous oxide-oxygen anesthetics	96
Nitrous oxide-oxygen-ether anesthetics	23
Ether anesthetics	347
Total	1526

From this data it is very evident that the physicians and anesthetists at Columbia Hospital believe in the superiority of ethylene-oxygen as an anesthetic. It should be said that it does not give uniformly satisfactory results. An occasional patient will do better with nitrous oxide-oxygen and at times one may wish to shift from one anesthetic to the other during a delivery or an operation.

NURSE ANESTHETISTS

It is obviously a financial impossibility to furnish a physician anesthetist for every delivery and every operation. It is highly desirable that internes give some anesthetics as a part of their training but with the present scarcity in most parts of the country they have little time for anesthetics. We have found that nurses make excellent anesthetists. In many ways they are better fitted to give anesthetics than most medical graduates and I believe that in the future most obstetric and a constantly increasing number of surgical anesthetics will be administered by specially trained nurses.

SUMMARY AND CONCLUSIONS

The woman in labor is entitled to the maximum relief of pain which is possible without sacrificing safety. With methods now in use there is no longer any excuse for the old time sound-proof crying room, and the delivery room is no longer a chamber of horrors. Formerly the outcries of obstetric patients made the nights hideous for everyone in a hospital, but today most women may be carried through labor with few moans and no outcries. Attention to pain relief does not require more nursing or medical attention than is necessary for the safe conduct of labor.

The obstetrician must be familiar with all methods of pain relief and adapt them to the needs of the patient during the different stages of labor. Standardization is impractical except in so far as a general plan may be followed. I have experimented with most methods of pain relief and as a result of animal experiments and clinical experience have adopted the following plan for my private patients:

First stage pain is relieved by hypodermic medication, occasionally supplemented by colonic ether-oil. Heroin gr. $1/12$ or pantopon gr. $1/3$ and hyoscin gr. $1/100$ is prepared in the syringe. The patient is told that she may have a hypodermic at any time she may wish it because of painful contractions. When she begins to complain a rectal examination is made to determine the degree of dilatation. If early in labor with little dilatation, pains moderate and contractions short, only one-half of the dose is injected, the rest being given when needed. A severe labor requires the full dose at one time. Colonic ether-oil is limited to the patients who have a tetanic type of contraction or an unusually painful first stage with slow dilatation of the cervix. Ether-oil is contraindicated if the patient has kidney disease or a history of an irritable colon or colitis. In long labors additional hypodermic medication is frequently needed, and reduced doses such as heroin gr. $1/24$ or pantopon gr. $1/6$ and hyoscin gr. $1/300$ may be administered. An attempt is made to avoid hypodermic medication during the last two hours of labor. Hypodermic medication may also be used during the night to give sleep to patients who may not have much pain but who are being kept awake by the constantly recurring uterine contractions. This tends to conserve strength and lessens the tendency to exhaustion late in labor.

Near the end of the first stage or early in the second stage of labor the patient is taken to the delivery room and intermittent gas-oxygen analgesia used as needed to control the pain. Many patients require gas only for a few minutes during the perineal stage. Either nitrous oxide-oxygen or ethylene-oxygen may be used. For the second stage analgesia ethylene appears to have some advantages over nitrous oxide. It is the more powerful anesthetic and may be administered with a higher percentage of oxygen. Both gases undoubtedly reduce the oxygen carrying power of the blood. During the past two years 580 patients at Columbia Hospital have had ethylene-oxygen for delivery. The average time of administration was sixty-three minutes and the average cost to the patient $12.00. The anesthetics were administered by nurse anesthetists.

Gas-oxygen is satisfactory for most operative deliveries except those requiring a considerable degree of relaxation such as version. For these ether may be added to the mixture but it is rarely needed when ethylene-oxygen is employed. Cesarean section may be performed with local anesthesia, combined anesthesia or with ethylene-oxygen. Caudal anesthesia or sacral nerve block is advised for patients with severe pulmonary cardiac and renal complications, with or without toxemia.

REFERENCES

Beckman, H.: Jour. Am. Med. Assn., Aug. 1, 1925, lxxxv, 332. *Danforth, W. C., and Davis, C. H.:* Jour. Am. Med. Assn., Sept. 29, 1923, lxxxi, 1090. *Davis, C. H.:* Am. Jour. Surg. (Anesthesia Supp.) Oct., 1917, xxxi, 98; Am. Jour. Obst., Oct., 1917, lxxvi, 557; Surg. Gynec. and Obst., Feb., 1918, xxvi, 170; Jour. Am. Med. Assn., May 17, 1924, lxxxii, 1607. *Davis, C. H., and Cron, R. S.:* Jour. Mich. Med. Soc., Dec., 1924, xxiii, 517. *Gwathmey, J. T.:* Anesthesia, ed. 2, Macmillan, 1925; Jour. Am. Med. Assn., Nov. 7, 1925, lxxxv, 1482. *Harrar, J. A.:* Am. Jour. Obst. and Gynec., April, 1927, xiii, 486. *Williams, J. W.:* Obstetrics (1925 Edition), p. 362.

141 East Wisconsin Avenue.

DYSTOCIA DUE TO FECAL IMPACTION RESEMBLING A PELVIC TUMOR

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Dystocia due to pronounced fecal impaction would seem to be of rare occurrence, for a search of the literature reveals but few cases. One case was reported by Rossner[1] in 1886. This patient had a rectovaginal fistula and during later pregnancy there was an impacted mass of feces as large as a child's head in the rectum. After manual removal, the patient, a multipara, was delivered spontaneously.

Another case was reported by L. Meyer[2] in 1899, in which an obstruction from fecal impaction was suspected. Later, symptoms resembling ileus developed. Subsequently the patient died and an autopsy revealed an obstruction due to a congenital deformity of the mesentery.

The following case seems worthy of report because the fecal mass resembled a tumor blocking the entrance to the pelvis and deflecting the fetal head, and because accurate record was kept of the mass removed, which was approximately the weight of a seven months' fetus.

M. E. J., aged 16 years, colored, came to the prenatal clinic of Washington University on July 9, 1926, with a history of having menstruated last on Feb. 19, 1926. The patient stated that she had been well, her bowels were regular, and it was necessary only occasionally for her to take small doses of Epsom salts. The date of her next visit was November 15, eleven days before the expected date of confinement. At this time a rectal examination demonstrated that the rectum was packed with fecal material. Vaginal examination showed the pelvis completely blocked. The cervix could not be felt. The head of the child was deflected into the left iliac fossa. Examination of the blood taken upon the first visit revealed a positive Wassermann reaction.

The patient was sent into Barnes Hospital where 265 gm. of putty-like fecal material were removed manually from the rectum. Thereupon, the patient was given an enema of mineral oil and hydrogen peroxide and an additional 975 gm. of fecal material were expelled. A second vaginal examination revealed a dilating cervix and a considerable amount of feces remaining. The enema was repeated and at this time 540 gm. of feces were expelled. The total amount expelled was now 1780 gm. (approximately three pounds and fifteen ounces). There was at this time three fingers' dilatation and the contractions were regular and of good quality. The patient was given morphine-hyoscine, the head entered the pelvis, and four hours later delivery was completed with a perineal forceps after a right mediolateral episiotomy. The child weighed 3010 gm. The postpartum course was uneventful. The bowels were kept regulated by daily administration of mineral oil and enemata of soapsuds.

On the twelfth day postpartum the patient was given a special barium enema and examination showed a general colonic hypotonicity of moderate degree, without any distention. There were atypical irregularities of the contour at the rectosigmoid junction and at the iliocecal valve; these, however, were not characteristic of any organic lesions.

From a practical standpoint, it is well to bear in mind the possibility of such extensive impaction of the bowels and its differentiation from pelvic tumors.

REFERENCES

(1) *Rossner:* Centralbl. f. Ges. Med., 1886, p. 808. (2) *Meyer, L.:* Monatschr. f. Geburtsh. u. Gynäk., 1899, p. 159.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D.

Recent Literature

SIR EWEN MACLEAN considers "puerperal mortality" in an article published in the *British Medical Journal* of March 13, 1926. Dr. Maclean is Chairman of the Puerperal Morbidity and Mortality Committee of the British Medical Association. He presented some remarks on the interim report of this Committee before the Monmouthshire Division of the Association. He believes that a zealous application of the knowledge we already possess by those who practice midwifery would result in striking improvement. It is in his opinion also true that until we acquire further knowledge there will remain a mortality rate sufficiently large to cause concern. "It was this consideration, I think, which led the Puerperal Morbidity and Mortality Committee of the Association to submit to the Council a recommendation urging that provision should be made for investigation into the factors which constitute, and the conditions which vary, resistance to disease, particularly as regards pregnancy and the puerperium." Recognizing that a community can, within limits, determine its own death rate it is necessary to expend considerable sums of money to secure the necessary institutions, equipment, and personnel to secure a lasting improvement in maternal morbidity and mortality. It is difficult and expensive to secure and maintain genuine and sustained interest of the public in these health matters. It took many years to convince the profession and public of the necessity for the Midwives Act.

The voluntary support of institutions, such as hospitals, blinded Governments to the necessity of providing money for institutions for research and for the care of the sick. A beginning has been made in the establishment of the Medical Research Council. Antenatal care is becoming recognized as reducing some of the ills and accidents of childbirth, but it is necessary to have proper provision for natal care in homes and institutions in order properly to "carry through." The absence of this principle is the greatest handicap to the proper notification of puerperal fever, which is essential to the success of our attack upon the largest single factor in puerperal morbidity. It is difficult to decide whether notification shall apply to (a) cases in which diagnosis of puerperal infection may be presumed to have been established, or (b) all cases of sustained puerperal pyrexia. The British Medical Association has taken the matter in hand as one of profound importance. It is gratifying to observe by many signs that the interim report of the above committee has aroused the deep interest of our Divisions and Branches.

"The Divisional replies to the questionnaire will be analyzed by the Committee, and before a further report, with recommendations, is submitted to the Council, the Committee hopes to have the great advantage of conferring with representatives of the Ministry of Health, the Medical Research Council, the Obstetrical and Gynecological Section of the Royal Society of Medicine, the Society of Medical Officers of Health and the Central Midwives Board, to which bodies the Council will issue invitations. The report and recommendations will in due course come before the Representative Body after consideration by the Divisions."

DR. LOUISE MC ILROY, in a paper read in opening a discussion on the interim report of the British Medical Association Committee on "Causation of Puerperal Morbidity and Mortality," presents some interesting material. This paper was published in the *British Medical Journal* of March 13, 1926. She states that in 1923 there were 758,131 living births with 2,892 maternal deaths, or 3.81 per 1000. Puerperal sepsis caused about one-third of these and eclampsia one-ninth. Deaths from other causes amounted to 1,552 or about 2 per 1000. She believes that the reduction of the infant mortality rate from 154 in 1900 to 77 in 1922 was due in no small measure to improved obstetric practice. She is of the opinion that there was definite evidence of wastage of infant lives, but that no such evidence exists regarding preventable wastage in maternal lives. Mortality statistics do not tell us of the suffering and disability which result from maternal morbidity. She recognizes that maternal morbidity and mortality are largely influenced by bad housing and economic or industrial conditions. In this presentation she limits herself to medical points of importance.

First: Extension of ante- and postnatal work is the most effective means of improvement. Antenatal and postnatal clinics should not be confused with those for child welfare clinics; the staff for these clinics should be composed of practitioners experienced in obstetrics.

Second: There is room for much improvement in education. There must be facilities for postgraduate training of young practitioners, and courses in which the older ones may refresh their knowledge. We do not want more lectures, but facilities for clinical work and the actual handling of patients under the supervision of competent teachers. It is necessary also to provide for the education and training of midwives who do 60 per cent of the deliveries of the country.

Third: The provision of more beds for abnormal cases and for women who desire institutional accommodation, owing to housing difficulties. The material thus provided could be utilized for educational purposes.

Fourth: Sepsis, though a notifiable disease, has no workable definition. We know it may be contagious and exogenous and may be largely avoided by cleanliness. We are satisfied that it is also endogenous, but we do not know how it arises. Facilities for research are necessary, especially directed toward immunity and the defensive nature of the bacteria of the genital tract.

Fifth: The existing organization of midwifery is chaotic. Panels of medical practitioners specially experienced in midwifery should be set up, and midwives call those members on these panels. The antenatal and other clinics should be coordinated. Cases of death in childbirth should be investigated. Cases of sepsis should be treated in open-air isolation wards of maternity hospitals.

Society Transactions

AMERICAN GYNECOLOGICAL SOCIETY

FIFTY-SECOND ANNUAL MEETING

HOT SPRINGS, VA., MAY 23, 24 AND 25, 1927

(Continued from the November issue.)

DR. G. BROWN MILLER, Washington, D. C., read a paper on **Surgery Versus Radiotherapy in the Treatment of Uterine Tumors.** (For original article see October issue, page 530.)

DISCUSSION

DR. FLOYD E. KEENE, PHILADELPHIA, PA.—I cannot emphasize too strongly Dr. Miller's remarks regarding the contraindications to irradiation in the treatment of benign uterine hemorrhage or the importance of accurate diagnosis, for upon these two factors success must depend.

I am convinced, however, that if the limitations are recognized and the contraindications observed, there are certain types of lesion in which irradiation is the method of choice and is preferable to operation. In addition to those he has mentioned I would add the adolescent menorrhagias which often can be controlled in no other way except by hysterectomy.

I would take exception to Dr. Miller's selection of the title of his paper, since the word "versus" implies competition and in my opinion, such is not the case. I believe that in the treatment of benign uterine hemorrhage there are two methods available: the one, operation, the other, irradiation. The indications for the one are just as definite as those for the other, that in no way should the one be considered a competitor of the other.

I quite agree with Dr. Miller in his statement that the majority of symptomatic myomas should be subjected to operation as is evidenced by the fact that during the past three years operation has been the chosen procedure in about 70 per cent of our cases.

On the other hand, in the 25 to 30 per cent of irradiated cases the results have been eminently satisfactory because of their careful selection, with the very minimum of morbidity and none of the dire disasters which Dr. Miller mentions as possible irradiation sequelae.

Nor do I believe that radiotherapy is still in the experimental stage as a method of treating benign hemorrhage. Many years of experience and an intensive follow-up study in the leading clinics of the world have removed this form of treatment from the realm of the experimental and warrant the statement that while the mode of action may still be somewhat obscure, the results of its action are no longer open to question.

In the treatment of cancer of the uterus, particularly cancer of the cervix, the question is still a debatable one, and the excellent results which Dr. Miller reports should make us slow in giving up operation in favor of irradiation.

I agree with him in advising operation in cases of corporeal carcinoma; in cervical cancer, however, operation has not been performed in our clinic during the past five years.

Our results so far as cure are concerned, while not so good as those reported from several other clinics, are equal to those obtained by operation as performed in Dr. Clark's clinic, so at present, I believe that in the early case the combination of cautery amputation and radium is the procedure of choice.

DR. C. JEFF MILLER, NEW ORLEANS, LA.—Since 1914 I have treated over five hundred cases of fibroid of the uterus and uterine hemorrhage with radium, and my experience makes me agree heartily with the statement Dr. Keene has made, that this type of therapy has long since passed beyond the experimental stage. Naturally, during the early years, we were obliged to proceed tentatively and we made many mistakes, but now that the indications, and, more important, the contraindications have been definitely established, irradiation is one of the most valuable methods of treatment which the gynecologist possesses.

In my private practice, with a careful selection of cases, I have treated probably 25 per cent of the fibroids I have seen during the last five years in this way. On the other hand, at Charity Hospital, where a large colored service presents entirely different problems, surgery has been indicated, usually of a radical kind, in probably 98 per cent of all such cases. These colored women present growths of enormous size and of all types, and the percentage of adnexal complications runs well over 90 per cent, so that radium may be employed only in the exceptional case.

I take issue with Dr. Miller in his views on irradiation in cancer of the cervix. For one thing, surgery in the borderline case should no longer be considered. Large series of cases prove that the borderline case is most often the advanced case, and radium gives results infinitely better than surgery. Control series of cases prove, quite aside from the high primary mortality which follows operation under such circumstances, that more five year cures are achieved by radium than by surgery. Surgery still has a place in the treatment of cancer of the cervix, but it is only in the extremely early case, when the diagnosis must be made by microscope. Speaking categorically, when the diagnosis can be made on clinical signs, the case is advanced and surgery is not indicated. For my own part, I have done only two radical operations for cancer of the cervix in the last eighteen months, and in both instances I could not make a definite diagnosis on the clinical evidence alone. In my opinion only two types of cervical carcinoma need be considered by the gynecologist; the early case, in which surgery is possible, and the advanced case, in which it is not. A further division into borderline cases simply introduces confusion, for it is a classification which depends entirely on the personal equation of the surgeon, and is therefore useless for practical purposes.

DR. FRANK W. LYNCH, SAN FRANCISCO, CAL.—During the last ten years, we have treated approximately 350 cervical cancers and have followed nearly all of them in our study. We have accepted five years as the minimum time for a cure since we find in our series twice as many three year cures as five year cures.

I have been very much perplexed in our radium studies because we have not cured as many early cervical cancers by radium as I feel we should if radium really does all that surgery can do. I find that I have cured fewer early cases by radium (only 30 per cent) than we have a right to expect because we have really cured several perfectly inoperable cases (9 per cent), and it seems reasonable to believe that radium should cure all early and local cancers if it cures any that are late and widespread. Study of the literature supports this view since there were a year ago only 308 reported cases of early cervical cancers that were treated with radium alone, only 40 per cent of which were five year cures. Heymann, whose results have caused the Swedes to restrict radical surgery for cervical cancers, obtained 16 per cent of five year cures by radium in late and borderline cases, and only 40.5 per cent in his early cases. This we believe indicates that the problem of radium has not yet been fathomed.

Contrasting the results of radium and surgery we find in the literature 2100 cases of cervical cancers that were operated radically, with 42 per cent of five year cures. Most of the surgical series were completed several years ago, when surgery alone afforded cure, and therefore included a very large proportion of borderline cases which furnished most of the surgical mortality and few five year cures. I am convinced from my own experience with radium surgery in the treatment of cervical cancers that, at the present time, there is a place for truly radical surgery in and only in the treatment of early growths. Practically, however, I find that I am operating upon only a very few selected cases and that I am treating with radium all that are not good operative risks, even though they have early cervical cancers. Thus far we have done 48 radical cases with five deaths, or approximately 10 per cent of operative mortality. Our first series of 17 early cervical cancers treated by radical surgery, some but not all of whom had radium preoperatively or postoperatively, has given 60 per cent of five year cures.

In cancers of the fundus there is also a difference of opinion. Contrary to the reports of others, I find that I am curing by the simple panhysterectomy comparatively few cases of cancer of the body of the uterus, for the reason I think, that formerly I have not selected my cases but have attempted to operate upon nearly all. Cancer of the body of the uterus, generally speaking, comes in older women who do not stand well the shock of a hysterectomy, so my operative mortality is far too high. Moreover, I have been distressed to find that many of the survivors presented late recurrences. By selecting carefully the patients that I operate upon and by radiating all others I believe I will have far better results than when I operated upon all, provided that I operate radically, since I have come to believe with Peterson that we shall cure cancer of the fundus only by the truly radical operations and not by the simple hysterectomy.

I feel, therefore, that any type of uterine cancer, cervical or fundal, is better treated by radium than by a simple hysterectomy, but that at present there is a definite although greatly restricted field for truly radical surgery in both cervical and fundal cases if they are early tumors and seem likely to withstand operation. I irradiate all cervical cases prior to operation.

DR. MILLER (closing).—I had expected to be criticized but these are my honest views. I must say that my experience with radium and x-ray has been largely that of an observer. I do not use it myself but I have carefully watched those who do use it. I have referred a number of cases to them and have reached these conclusions by my own experience with surgery and comparing that with the results of the men who employ radiotherapy in the treatment of fibroid tumors and cancer of the uterus.

DR. JOSEPH B. DELEE, Chicago, Ill., presented a paper entitled **Two New Ideas on the Mechanism of Cervical Injury During Labor.** (For original article see October issue, page 499.)

DISCUSSION

DR. COLLIN FOULKROD, PHILADELPHIA, PA.—Some years ago I made a study of the lacerations of the cervix and found that among a number of patients in the hands of all operators in one clinic there was something like 5 per cent of noted cervical lacerations. I find now in my own private practice there are less than 2 per cent which need repair; as the years go on the lacerations are slowly growing less. We are using more sedatives, waiting longer for the normal dilatation, and securing better results with regard to the different forms of lacerations. The forms enumerated by Dr. DeLee may be added to by suggesting that one of the causes of laceration is the rigidity of the tissues, which he has suggested in his form of possible development lacerations. It has been impressed upon me that the time is rapidly coming that when a woman cannot dilate the cervix more than one finger in more than twenty-four hours we shall consider a cesarean section rather than allow her to push down the cervix in front of the child's head causing a prolapse of the uterus, as well as an eversion of the canal.

DR. H. C. BURGESS, MONTREAL, CANADA.—Whenever I see a large fibrous polyp expelled through a resistant cervix without any damage, I am convinced that the kind of dilator and the element of time are the important factors in any laceration of that appendage. In my experience this element of time can best be controlled, with the greatest margin of safety as far as the mother and child are concerned, by repeated doses of heroin given at frequent intervals. Hemorrhage is the only indication that prompts me to interfere with the cervix immediately after the delivery is over. The one exception to this rule is perhaps when I have been called upon to do a version and extraction. If hemostasis becomes necessary simplicity of operation is essential, and I depend on a deep suture, paying particular attention to the upper angle of the wound and making every effort to include the musculature of the cervix.

DR. WILLIAM C. DANFORTH, EVANSTON, ILL.—Stimulated somewhat by the paper that Dr. Farrar read here last year in which she brought out the possible relationship between cervical injury and the production of cancer, and by the discussion which followed, which seemed to show that the interest of our members was centered upon the curing of pathology rather than upon its prevention, I looked up the private cases taken care of by my associate and myself during the past three years, excluding all others because we had very accurate records of these. The total was 975; eliminating all cesarean sections, in which, of course, cervical injury cannot occur; eliminating all cases in which bags were used, which were few; and eliminating any cases in which any degree of manual dilatation was done, left us 920 cases. In these we found recognizable tears which were sufficient to demand surgical attention in 104, a little more than 10 per cent. We regarded anything as requiring surgical attention if the tear was as much as 2 cm. They varied from 1 to 5 cm.

In studying these cases we noticed also this same V-shaped characteristic which Dr. DeLee has mentioned. Dr. DeLee did not emphasize as much as I had hoped he would the necessity of putting in sutures in a definite way. If the sutures do not take in the entire musculature of the cervix, together with the muscle that is retracted at the time, they almost always fail to be effective, and I believe that is the reason why so many men have felt that the repair of the cervix was of little value. Also, the sutures must not be tied tightly because the cervix is soft. They must be brought together very loosely and inserted about 1 cm. apart.

I believe too, as stated by the last speaker, that the use of an opiate during the first stage of labor not only keeps the patient quiet but has a definite relaxing effect upon the cervix and helps avoid some tears. I do not think that suture of the cervix is a procedure which we can recommend for use indiscriminately. It is definitely a surgical procedure, an operating room procedure. With those conditions present I believe it is a very valuable addition to our technic and well worth trying. It is often said that it is unnecessary to pay any attention to these lacerations, that they will heal spontaneously anyway. If that is so, why do we see so many deeply gashed cervices in our daily gynecological work?

DR. DELEE (closing).—The cervix is thin at the sides. The borderline between the two muscular anterior and posterior lips is filled with connective-tissue fibers and some muscle fibers. Right alongside the cervix, when the woman is pregnant six to eight weeks, it is easy to feel the soft character of the tissue like a groove and I have used that often as a means of early diagnosis of pregnancy.

Has any one ever found a woman with cancer of the cervix who has had cesarean section, unless she had had several babies through the natural passage? We know cancer occurs in *multiparae*.

Dr. Danforth reports only 10 per cent lacerations of the cervices. I have had many more than that. Pituitrin is one of the greatest causes of laceration of the cervix. We almost never use pituitrin in the first stage of labor. Occasionally at the beginning of labor we use ½ to 1 minim, but after the pains have started pituitrin is discontinued.

The differentiation between contused and torn tissues, after labor has been a difficult thing to make. We try to do that by differential staining. By painting the cut surface with mercurochome, the vaginal portions of the cervix can be very easily distinguished.

DR. GEORGE W. KOSMAK, New York City, presented a paper entitled **Fundamental Training for Obstetric Nurses.** (For original article see *Surgery, Gynecology and Obstetrics,* November, 1927.)

DISCUSSION

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MARYLAND.—Every one admits that something is radically wrong with the nursing situation, and I think that as doctors and as members of hospital staffs with training schools for nurses a great part of the responsibility is ours, because in the early days when such schools were developing we allowed their control to drift entirely into the hands of the nurses and of the hospital superintendents, neither of whom were usually fitted to cope with educational problems. The result is that in most institutions the training schools are run primarily for the benefit of the nurses, and especially for the advancement of the status of women in general, and with relatively little regard to the welfare of the patients or to the medical needs of the hospital. Indeed, I think it safe to say that in the majority of the best hospitals advice concerning the conduct of training schools is rarely asked of the more experienced members of the medical staff, and that when it is volunteered, it is regarded as impertinent interference.

Moreover, the strictly medical teaching is done in great part by young men, who stand rather in awe of the nursing authorities, with the result that the type and scope of the instruction is dictated by the latter, and often resembles a compressed curriculum of a medical school, instead of the practical instruction which is desirable. In other cases, the young teachers, carried away by their enthusiasm, waste hours in teaching about rare diseases which have no practical significance.

We cannot escape our share of the responsibility, for we have allowed such conditions to go unchallenged for thirty years, and have not faced the problem until it has become acute. At the same time, it is only fair to admit that in the past the pupil nurses were exploited by many hospitals, and were utilized with more regard to economic exigencies than to sound education.

Following the war a very radical change has come about, namely, that the scope for the remunerative employment of educated young women has become greatly extended. As a result relatively smaller numbers are applying for admission to the training schools, so that in all but a few of the best ones the applications for admission do not keep pace with the demand, and two things have happened. One is that in certain institutions those in charge of the schools have appealed to the medical staff for aid, and the other is that it has been attempted to face the problem in another way, and to bolster up and dignify the profession of nursing by giving it a university status. In this event, the three years of training are regarded as the equivalent of two years of college work, and are counted as part of the credit toward a collegiate degree. To my mind, the latter may mean a great advance in education, but it will by no means solve the problem of providing intelligent nursing care either for the sick poor in the hospital ward or for the well-to-do in their own homes.

I must confess to being a heretic as regards college education in general; for, as conducted in this country, I regard it as an unmitigated failure and as a waste of time and money whether for men or women. I am glad to say that the Johns Hopkins University has come to the same conclusion, and has decided to do away with the Bachelor's degree and to limit its activity to the training of serious-minded students, who may eventually obtain the degree of Master of Arts or Doctor of Philosophy.

This decision has put a very effective quietus upon the proposition of giving a collegiate degree to our nurses, for, if we are abolishing it in the case of men, it would be absurd to revive it in the case of women—whether nurses or not.

A few years ago, when the situation was becoming difficult at the Johns Hopkins Hospital, a joint committee consisting of the superintendent of the training school and her chief assistant, the director of the hospital, and the heads of three of the main clinical departments, was appointed to consider the problem and to see what could be done to improve it. One of the first things was to make a careful survey of the curriculum in vogue, as well as those recommended by the various organizations interested in the training of nurses. It would lead too far to discuss the matter in detail, and here I shall only say that we made a radical cut in the number of lectures and in their stead substituted practical bedside instruction, which is often given by the heads of the various departments.

We realized where our fault lay, and we had the courage to face it frankly. In the obstetric training, we have eliminated a large number of lectures, and in their place my senior associates and I give a series of practical demonstrations in the delivery room, at the bedside, and in the nursery, which I feel confident will give the pupil nurses a totally different and more practical view of the subject. I believe that this is one of the ways of facing the problem, but it means that the senior members of the medical staff must take part in and control the practical instruction. The whole question is a big one, and the closer we look into it the more complicated we find it.

Do not think from what I have said that I am opposed to women of the highest education taking part in nursing. I am not, but I believe that such education should precede or follow the practical training of the nurse, and that only a few women will profit from it, such as those going into executive posts, teaching, or special work. On the other hand, I feel that the so-called academic education will not help in solving the problem of giving sound nursing care to the sick.

No one can deplore more than I the feeling that the profession of medicine and nursing are antagonistic. They are not, and should not, be so. Each is mutually dependent upon the other. We cannot take proper care of the sick without the nurse, nor can she without us, but from my point of view nothing can be gained by teaching the nurse to be a poor doctor, and to feel that she is demeaning herself by giving kindly and intelligent care to the sick.

DR. WILLIAM R. NICHOLSON, PHILADELPHIA, PA.—This subject is an extremely important one, and its presentation is very timely. If the subject were not so important, its discussion could be entirely of a humorous nature, based on the book which I hold in my hand. This book is a syllabus of obstetric lectures, to be given to nurses in training, and my experience with it began at the time of the late war, when my assistants were all in the Service, and I had to undertake the lectures for the nurses at the Presbyterian Hospital in Philadelphia, the Graduate School of Medicine of the University of Pennsylvania, and the Methodist-Episcopal Hospital of Philadelphia. At this time I was shown the book by one of the directresses of nursing, and on looking it over, I found that there are thirty hours in the obstetric course, and that ten of them are to be given by a physician.

Now, those of us who have been teaching medical students know that we cannot put into a vessel more than that vessel will hold, and with this fact in mind, I would call your attention to a couple of the lectures as outlined in the book. These are chosen at random, any other of the ten lectures is open to the same criticism which I am making of these two.

The first lecture calls for a brief history of obstetrics; a consideration of the place of obstetrics in medicine, and the significant points in delivery. Remember that this is a lecture, supposedly to be given in one hour.

I would like, in addition, to call your attention to the fourth lecture. The general title is *Reproduction in General*, and in this hour the instructor is supposed to compare the cell differentiation in unisexual and bisexual animals, and also to consider the relation of sex to pregnancy, and the other aspects of sex.

All of us in this room are or have been actively engaged in the teaching of medical students, and I submit that even a fourth year medical student, trained as he is to absorb more or less indigestible mental pabulum, would be unable to get anything out of a lecture of this wide diversity in subjects, even if a teacher could be found who would be insane enough to attempt such in an hour's work.

These two instances will suffice to show the general lack of comprehension of the subject by whoever was responsible for this syllabus. Any of you who care to do so can look over the remaining lectures as given in this syllabus, and form your own opinion as to the value of such instruction. To my mind, it is a perfectly plain case of incompetency on the part of those who control the education of nurses at the present day. This type of instruction has absolutely no bearing upon the needs of the nurses. No living man or woman could possibly intelligently receive this tremendous mass of material in ten hours' instruction.

I give way to no man in my interest in the training of the nurse, but there must be at least a reasonable amount of intelligence exercised by those who assume the responsibility for their instruction.

DR. WILLIAM A. SCOTT, TORONTO, ONT.—Even in a country so primitive and wild as Canada the question of the education of nurses has become very acute; so acute in my particular section that at present I am acting on a committee which is trying to find out whether there is any possibility of a solution of the problems that have been brought up tonight. We find that it is much easier to be critical than it is to be constructive. The problem is out of our hands and that has happened in the way that Dr. Kosmak has spoken about tonight. We are not satisfied with the way the nurses are being trained. They are no longer nursing. In the first place, it is with great difficulty that we can get a nurse to take cases outside of a hospital. In the hospital, except in very dull times, nurses will not accept night duty. For a time they registered against obstetrics until they were forced to nurse obstetric cases for one year. At the present time in some of the institutions, at least, I am quite convinced that the majority of nurses no longer look upon a patient as a patient at all; she is simply a room number.

Recently I had a patient who entered the hospital at seven o'clock at night. She was operated upon at nine o'clock the next morning and during that time she had six different nurses looking after her and taking part in her preparation. As a matter of fact, one nurse started to give her an enema and a second one finished it. I do not imagine there was one of the six nurses who even knew the patient's name. We feel that that is not nursing, and the problem is just as acute from one end of Canada to the other as it is in the States. The situation in Canada has arisen partly from the situation over here. Our nurses have followed the syllabus that has been laid down in the United States, more especially in New York State, and apparently we cannot get away from it. As I see it the situation is out of our hands; it is a legislative situation. We propose to do something about it, however. One of our proposals is that we shall start a register in the Academy of Medicine where we shall register every group of medical attendant, the trained nurse, practical nurse, male nurse, mother's helper, masseuse, and these will all be on call for medical men who can choose the particular type of attendant that they think is required in a particular case.

I believe Dr. Kosmak has proposed something that will be of value. If it is possible for a Society such as this to go on record in a very conservative but very positive way regarding their opinion of what constitutes the basic education for a nurse, a great deal will be accomplished.

DR. JOHN A. McGLINN, PHILADELPHIA, PA.—This has been a very interesting discussion and at times rather humorous, but I am thoroughly convinced that it will not get us anywhere because the question of nursing education is only a small part of the present tendency of education in general. The place where we should start reform in nursing education is in the primary school education up to the college education as it exists today. I do not know any child in the modern school or college who can speak German or Latin or Greek after he finishes college unless his governess has taught him this in his childhood. In other words, simply crowding facts into one's mind without proper understanding, means a failure in education. When we start to criticize the nurses we might as well criticize our own profession. Why should a man be doing all sorts of tests, witnessing elaborate operations in the surgical laboratory upon the skull and the spinal cord; in another department seeing all sorts of operations which he will never do, and in addition being compelled to do research work and present papers in his senior year, and giving him a lot of facts he will never digest, instead of making a doctor out of him? When we solve these problems we may possibly be able to accomplish something with the problem of nursing education. Modern education has gone on the rocks and we are not turning out educated men and women today. We are turning out a lot of halfwits from college; their brains are not being developed properly, they are not able to fit in the walks of life and many suicides are being committed because they do not know what it is all about.

DR. KOSMAK (closing).—I had hoped that somebody would say something in reply to what I have proposed, on the other side of the question. It is very pleasant indeed to find such unanimity of opinion on this subject. However, that will not accomplish anything and Dr. Litzenberg's proposal is exactly what I have proposed in my paper, that the Society take some definite action to define actually what we consider would be the proper training for an obstetric nurse.

Unfortunately doctors have proposed little or nothing in place of what we condemn and that, of course, is just what the nursing authorities desire. As long as we do not propose anything in place of what they have they say our arguments are not constructive but merely destructive criticism. I think we should appoint a Committee to write out a syllabus of obstetric lectures, and then adopt it officially as the best thought of the united membership of this Society.

DR. R. A. BARTHOLOMEW, Atlanta, Ga., (by invitation) presented a paper on **Prophylactic External Version—Review of the Literature and Analysis of 81 Attempted External Versions in 54 Consecutive Cases.** (For original article see November issue, page 648.)

DISCUSSION

DR. EDMUND B. PIPER, PHILADELPHIA, PA.—Morriceau, in 1683, stated that when the child was found in a position with the breech presenting it had been advocated by certain practitioners that this be changed into a head presentation, but if they could definitely show him how this could be done he would be glad to do it.

I am speaking about something that I have never tried. I have not tried it for the reason that I would rather deliver a breech than I would a vertex in all patients except the primipara. That is a peculiarity, but in all of these injuries to the cord of which Dr. Bartholomew speaks the hemorrhages can be largely avoided if forceps are routinely put upon the aftercoming head and traction is not made upon the neck or upon the brachial plexus.

The spontaneous version which has been spoken of, I believe Dr. Bartholomew said he had never seen in the ninth month. Less than six weeks ago one of our cases was diagnosed as a breech presentation by x-ray and I verified the x-ray findings by manual examination. The next day the patient went into labor; she said the baby had turned around during the night. On examination again I found the head presenting; that was at the end of the ninth month.

I cannot quite conceive of the lack of danger in such a procedure. If one has ever done many podalic versions where one can feel all of the parts of the child, if there is a chance of the neck coming through the cord, as various blunders in many podalic versions will occur, there is just as much chance of those things occurring in the external version as in the internal. I am not inclined to think that if there is a breech presentation,—not with primipara but with multipara,—there is any reason for doing external version.

DR. HUGO EHRENFEST, ST. LOUIS, MO.—When I saw this paper announced I asked my associate, Dr. Liese, to collate from our private records all the data in regard to external version. Only a few hours ago I tabulated them without knowing anything about Dr. Bartholomew's figures; the identity of our results is striking. He had 54, and I, 53 cases of breech presentation encountered in pregnancy, of which he successfully turned 47 and I, 46, so that we both record 7 failures. Of these, in three cases the cause of failure was ascribed to abnormal shape of uterus (narrow uterus with oligohydramnios; fibroid, and one completely septate uterus finally requiring cesarean section). In three others, the attempt at version was made too late (one already in labor, the two others one and two days respectively before delivery), in the seventh case, the fetus had two large polycystic kidneys. Of these seven babies delivered in breech presentation, two were lost (the case of oligohydramnios and the baby with cystic kidneys).

The successful forty-six versions were done mostly within four to six weeks before labor, some within two weeks, one two days before delivery. All were done without anesthesia, in my belief, a most important point, because without anesthesia the procedure necessarily has to be done so gently that it is impossible to do the harm, unjustifiably feared by some writers. One of the cases of successful version had the shortest cord I have ever encountered, it required clamping and cutting within the vagina to permit escape of the fetus. This baby certainly would have been lost in a breech delivery.

Only five of the versions are noted as difficult on my records; 40 are specifically qualified as easy.

In regard to the technic I would stress just a few points: It is most important first to free the breech if already in contact with the pelvic inlet. This is best done by suspending the patient for fifteen to twenty minutes in the Trendelenburg position. When doing the version, the effort should be mainly directed toward pushing the breech upward; failures, in my opinion, are chiefly due to the seemingly more common attempt to push the head out of the fundus down towards the pelvis. If effort to turn in one direction (pushing breech up along vertebral column) fails, the attempt must be continued in the opposite direction (pushing breech towards fetal legs); this latter direction, in the sense of an increased flexion of the fetal spine proved to us three times as often advantageous as the other direction.

With only six exceptions (requiring repetition from one to three times) the very first version, without bandages, etc., maintained the fetus in cephalic presentation.

The babies were of average size, but three of them were over 4500 grams, and in all three the version was noted as easy. One baby weighing 4650 grams was easily turned in a iv gravida two days before delivery. In one case of successful external version a marginal placenta previa, discovered during labor, forced me to do again a podalic version.

Of the 46 successfully turned babies two were lost: one was born macerated, the mother luetic, with four plus Wassermann. The other died in labor, after fairly difficult forceps extraction in a primipara.

This mortality alone, in my belief, proves the justification for an attempt at external version in every case of breech presentation discovered within the last six weeks of pregnancy. I thoroughly agree with the essayist's statement that external version must be regarded a proper part of prenatal care.

DR. CARL HENRY DAVIS, MILWAUKEE, WIS.—Many breech presentations change to vertex late in pregnancy and had Dr. Bartholomew waited until nearer term the number of cases would be materially smaller. Attempts at external version may prove disastrous unless one manipulates very gently. One of my patients who moved to another city recently lost her baby from an external version performed under anesthesia. This led me to study my results in breech delivery, and I found that in the past seven years 32 babies had presented by the breech. Of these there was only one, an anencephalic, which was not delivered alive and free from injury.

I believe with Dr. Piper that the high fetal mortality in breech cases come from manhandling and failure to use forceps on the after-coming head when it does not come through easily. We used to teach external version in theory, but saved all of our breech cases for demonstration before groups of students. The high mortality from breech presentation in home deliveries suggests that all these cases should be sent to the hospital.

DR. JOSEPH B. DELEE, CHICAGO, ILL.—I believe that a middle course should be pursued. If version is possible with gentle means in the last 2 to 8 weeks of pregnancy, it should be attempted. If version becomes difficult on the ordinary operating table, without an anesthetic, it should be discontinued and the patient allowed to go to term. In some of the cases in which I failed with external version I found some interesting things by means of the x-ray. In two of the cases the baby's head was extended with a face presentation. In one case the baby had an extreme lateral flexion of the head, the ear resting on one shoulder.

When trying to do the version one should listen to the heartbeat every two or three minutes and if it shows signs of distress the attempt should be stopped. The placental site should also be decided upon before version is started and if the placenta is on the anterior wall in the line of version it is better to quit. The contour of the uterus and the simple expediency of pressing the stethoscope against the baby's back will help in determining this.

DR. BARTHOLOMEW (closing).—I agree with those who have emphasized the importance of gentleness and care in doing external version. That, of course, is very important, particularly if one uses an anesthetic and may thus be inclined to use too violent pressure and keep it up continually. But if one uses the care that he would if the patient were not under the anesthetic there is not much danger. The object of the anesthetic after all is simply to do away with the resistance which is occasionally such an obstacle to palpation.

The French and Germans have emphasized the life saving value of external version as a factor in reducing the death rate and saving more babies.

The figures, I think, speak for themselves. We have to accept a certain figure for mortality in breech presentations and this applies to general practice. We are trying to make obstetrics safer in general practice. The specialist may deliver breech presentations safely, but it is quite a different matter with the general practitioner. The true value of external version will not be realized until medical students are taught the need of prenatal care and how to diagnose presentations accurately, and if this knowledge is made use of in general practice, I feel sure it will be the means of saving many babies.

DR. RICHARD R. SMITH, Grand Rapids, Mich., presented a paper on **Toxic Goiter and Its Relation to the Gynecologic Patient.** *(For original article see October issue, page 518.)*

DISCUSSION

DR. W. E. CALDWELL, NEW YORK CITY.—Diseased thyroids occur about eight times more frequently among women than in men. It is to be expected, therefore, that the gynecologist, especially in the so-called thyroid belts, should, in the practice of his specialty, encounter many patients with thyroid complications. In the presence of a goiter one may assume a change or upset in the thyroid function; but the nature and direction of such an upset is a matter for careful study. Toxic goiter, if the expression is to have is specific meaning, indicates the presence at least of an increased metabolic rate resulting from the thyroid dysfunction. All too frequently thyrotoxis is adjudged present without even an attempt being made to determine the basal metabolic rate. Dr. Smith, in his paper, has given us a very comprehensive symptomatology of the condition recognized as Graves' disease, and he emphasizes the basal metabolic rate as the final arbiter in the diagnosis. There is a great deal of confusion and contradictory evidence as to the physiology and pathology of the endocrine glands. Apparently, the genesis of toxic goiter has no definite relation with pelvic disease save a possible exception of a regional infection being a significant factor in the production of thyrotoxicosis. Geist, at the Mount Sinai Hospital, found no change in the metabolic rate after ovariectomy, and Corscaden, at the Sloane Clinic noted that the metabolic rate is unchanged after sterilization by the use of radium and the x-ray. As Dr. Smith has pointed out, the usual gynecologic cases call for secondary consideration in the presence of toxic goiter. The treatment of the toxic thyroid state has today taken on the status of a specialty in medicine. There are elements calling for the experience of the internist with the use of iodine therapy, the radiotherapist, and the surgeon. The method of choice in the treatment depends on the particular factor in that case. For the gynecologist, his chief concern should be the recognition of the toxic state in patients under his care and the use of approved procedures in establishing a correct diagnosis. In the Sloane Clinic, toxic thyroid or toxic goiter cases have been rare, but a condition noted which closely simulates thyrotoxicosis which may be due to ovarian deficiency. The patients usually were in their thirties, showed a marked degree of nervousness and irritability, some tremor of the hands and tongue, sweating, moderate enlargement of the thyroid, slight loss of weight, frequently hot flashes; all of which symptoms were exaggerated about the time of menstruation. Repeated basal metabolic tests, after some days of rest in bed, failed to show any significant elevation, and in some of these cases good results have been obtained by using the whole ovary preparation together with small doses of thyroid extract. I could find but few cases of proved toxic thyroid among our gynecologic cases. In the obstetric service, where all patients showing any complications are studied by the medical department, twenty-two cases of toxic thyroid in the last six thousand cases have been found. The majority of these have carried through to term and been delivered of living children. Five of the twenty-two had to be aborted on account of the seriousness of the condition. Three of the ones that were aborted improved after the abortion; one was lost track of, but her condition was unchanged when last seen by us; the other patient had serious bleeding at the time of the operation and died a few days later.

DR. ARTHUR H. CURTIS, CHICAGO, ILL.—Within the last two or three years I have been surprised at the number of borderline cases with symptoms of toxic goiter. Whether we have been overlooking them in the midwest, or whether the situation has changed materially in the last few years, I do not know. I am rather inclined to think that we have been overlooking them and that the basal metabolic rate has informed us that we have been negligent in making diagnoses. This means of information is used as a routine whenever we have a patient in whom the diagnosis is complicated or difficult.

We have a group of patients who, despite nervousness, have a markedly *decreased* rate, and in whom the administration of small doses of thyroid extract has been materially helpful. In common with others we have learned that many patients who are tired or sluggish are distinctly below normal in their thyroid activity. But above all I wish to emphasize that this class of patients may, on the contrary, have symptoms that simulate toxic goiter; in these cases thyroid extract in small doses is particularly beneficial.

DR. CARL HENRY DAVIS, MILWAUKEE, WIS.—My first experience with this condition was some fifteen years ago when a patient came into the hospital believing that all her trouble was due to a relaxed perineum and a lacerated cervix. Examination showed that she had a typical toxic goiter of the exophthalmic type. However, we could not get her consent for treatment of the thyroid disease until after she had had something done for what she thought was wrong with her. During the last fifteen years I have seen a good many borderline cases where it was often difficult to determine whether the symptoms were due to the pelvic conditions or to something else. I have come to believe that in our gynecologic work we must eliminate all other possible reasons for the symptoms before advising operative treatment.

It is not necessarily a hyperfunction of the thyroid that is causing trouble, it may be a hypofunction, and may fluctuate from one to the other. After a period of mild hyperthyroidism the patient may come back a year later with symptoms, but suffering from hypothyroidism. It is not always necessary for patients who have relatively small thyroids and mild symptoms of exophthalmic goiter to have surgical treatment, because with rest, sedatives, and iodine for a number of weeks, the symptoms will clear up, and the metabolic rate will return to normal. Some of these patients later return with mild hypothyroidism.

DR. G. BROWN MILLER, WASHINGTON, D. C.—A number of years ago, before the metabolism test came into vogue, I was working in the gynecologic dispensary in one of our hospitals in Washington and a patient was sent in from the medical dispensary with a diagnosis of exophthalmic goiter. She had the typical symptoms: rather an acute enlargement of the thyroid gland, some exophthalmus, rapid pulse, nervousness, etc. She was sent in because she complained of pelvic discomfort. I found a large retroverted uterus, put it in position, put in a pessary, and sent her to the country. She was also given iodide of potash. She came back to us in a few months, the enlargement had disappeared, the exophthalmus had largely disappeared, she was no longer nervous, and the uterus was in good position. I did an operation for permanently restoring the uterus to normal position, and she has never had a symptom of exophthalmic goiter since.

DR. JAMES C. MASSON, ROCHESTER, MINN.—We see a great many cases with the coexistence of a pelvic condition and toxic goiter. It is of great importance to differentiate between exophthalmic goiter and the toxic adenoma. The two conditions are absolutely different, and the preoperative management is different.

In the exophthalmic goiter, improvement can be obtained in every case by the administration of Lugol's solution; in the other type this is unsatisfactory. In some cases it has no effect, in other slight improvement is noted, and in some the condition becomes worse.

I believe that sometimes the two conditions coexist to some extent in the same patient. We feel at the Mayo Clinic that any toxic condition of the goiter should be taken care of before any other operation is done, and it is seldom in gynecologic conditions that this rule need be changed, because a little time will not make much difference. These patients can all be made better, and surgery on the thyroid is no longer considered a serious operation. Patients can be out of bed from the third to the fifth day.

As to the cure of exophthalmic goiter without operation, there is no doubt that an occasional case of definite thyroid of the exophthalmic type undergoes a spontaneous cure. In the British Isles, at least until recently, they seldom thought it necessary to operate because these cases, under medical management, frequently ran a short course with no tendency to recurrence. Our experience has been that exophthalmic goiter has a marked tendency to recurrent attacks; that is, there will be a period when there will be a definite crisis, the patient will improve and be in apparently normal health for some months, then there will be another crisis. In the toxic adenomatous type there is, of course, a constant downward course.

DR. JOSEPH L. BAER, CHICAGO, ILL.—Just a word of caution. It is so easy to prescribe Lugol's solution or thyroid extract that perhaps many of you have done what I have done in the past, undertaken to handle a mildly toxic thyroid simultaneously with office treatment for gynecologic conditions. After several unhappy experiences I subscribe to the idea of the surgeons, that the administration of Lugol's solution to a toxic thyroid patient has only one purpose and that is preparation for thyroid surgery. If the administration is continued over a number of weeks that patient is likely to be precipitated into a condition that will make her a very bad risk surgically, whereas, if it is brought to a climax rather quickly and followed promptly by surgery the result will be much more satisfactory.

DR. FRANK W. LYNCH, SAN FRANCISCO, CAL.—I had hoped that the discussion might bring out the relation that appears to exist between the thyroid and fibroids, in patients who do not live in thyroid districts.

Recently I have had the opportunity of studying six hundred cases of fibroids in my clinic. I divided them into large and small tumors, although as the former, we considered those which in the past would not have been considered so large, that is, tumors the size of a four months' pregnancy, or too large to be treated with radium. Twenty per cent of the fibroid cases had some goiter, adenoma, or an enlarged gland. This is of interest since California is not a goiter country and only few came from goiter districts or pockets. It also is of interest that the goiters were twice as frequent in the so-called large fibroid group as in the smaller tumors. As we review the literature of fibroids, we must acknowledge that the etiology given us in the past for these tumors does not stand up under the modern tests, and that a close relation between the thyroid and ovary is now universally recognized. Thyroid enlargements are common at the time of menstruation and during pregnancy. If they occurred as often with old pelvic inflammations as they did with fibroids, I would have found them as often in the group of small tumors as in the larger ones, since the majority of the patients with small tumors had old pelvic inflammations.

DR. WILLIAM S. STONE, New York City.—At the thyroid clinic at the Memorial Hospital in New York we not infrequently see a patient who has perhaps been doing fairly well under treatment for the thyroid, but uterine bleeding occurs. An examination reveals a uterine myoma. It is frequent enough to make this subject worthy of our serious consideration. What the relationship is, if any, I do not know. Of course, we have so many women with uterine fibroids, it is not, perhaps, strange that they should appear among a large number of thyroid cases, but they do occur synchronously, and the uterine hemorrhage is a disturbing factor in the course of the toxemia, so that the question of how the fibroids are to be treated, often offers a problem.

It is in some of those cases that we have occasionally used radium or x-ray for stopping the uterine bleeding, so that the treatment for the toxicity due to the thyroid may be continued. The tumors are not usually large and an undesirable operation may be thus avoided.

DR. J. HOFBAUER, Baltimore, Md.—Although the local conditions largely affect the conceptions of the individual investigator, we may now conclude, on the basis of present knowledge, that thyroid intoxication in general exerts an effect primarily on the heart and on the liver, as recently shown by Youmans and Warfield. The extent of the impairment of liver function was determined in their investigations by Rosenthal's test and it became evident that the glycogen formation was markedly interferred with. Thus, the glycogen-poor liver, resulting from thyrotoxicosis, may be more susceptible to an additional damage by some toxic agent, anesthesia, etc. (See *Archives of Internal Medicine*, 1926, xxxvii, No. 1.)

Bearing in mind that there exists an interrelation between all endocrine glands and that clinically thyroid disturbances are not infrequently associated with menstrual abnormalities, our search was directed toward influencing abnormal ovarian function by x-rays, applied to the thyroid, the hypophysis, or the spleen. An experience in Döderlein's clinic showed that spleen radiation should be principally employed for prompt stopping of hemorrhages, particularly when due to fibroma or incident to the climacterium. Radiation of the liver is sometimes effective even when the radiation of the spleen has failed to stop profuse menstrual bleeding in young women after unsuccessful curettage. In cases of dysmenorrhea and amenorrhea, radiation of the hypophysis rendered a valuable service. A prompt effect of radiation of the hypophysis was often seen in women in whom menstruation occurred at short intervals or was too free. As a matter of fact, in certain refractory patients of this group the radiation of the thyroid succeeded. The decrease in size of an enlarged thyroid after radiation of the hypophysis, as occasionally observed in our series of cases, bears directly on the pituitary-thyroid relationship.

DR. HUGO EHRENFEST, St. Louis, Mo.—It is my belief, that the climacteric patient who is seeking relief for her rapidly increasing weight requires particular attention. As a rule, increased thyroid function expresses itself in a loss of weight, but in the case of the climacteric patient, with the general upset in metabolism, occasionally increase of weight might be associated with increased thyroid activity. To give such a patient thyroid extract carelessly might prove disastrous.

DR. SMITH (closing).—The purpose of this paper was simply to direct the attention of gynecologists to this very important disease, to point out how we may recognize it in the course of an examination, and to comment on certain other facts that I thought were of importance in this connection. In the outspoken case there is no difficulty in diagnosis, but it is the rather obscure and doubtful case we are apt to overlook and I had this in mind when writing this paper. We do not know the reason for having so much toxic goiter in the Middle West, but certainly there has been a great increase in the number of such patients during the last few years. Part of this undoubtedly is due to the education of the public and the profession, but there can be no question that there is an actual increase in frequency. Some of us think that the promiscuous use of iodine may have something to do with it. Many of our people are taking iodized salt and many patients with goiter are taking iodine in some form. We believe, of course, that iodine should be taken only under a physician's care, and its dangers in causing toxicity in those with goiter should ever be borne in mind.

DR. ROBERT L. DICKINSON, New York, N. Y., presented a paper entitled **A Gynecologist Looks at Prostitution Abroad.** (See November issue, page 590.)

DISCUSSION

DR. GEORGE W. KOSMAK, NEW YORK CITY.—We are very much indebted to Dr. Dickinson for having the courage to bring before this Society a topic which has unfortunately been sidetracked by the men who should have displayed the greatest interest in it, namely, the gynecologists.

There are two large aspects from which this question must be viewed,—the social and the medical. The people who have taken up the social aspect have gained rather the greater attention, but comparatively few have had either the desire or the courage to take up the strictly medical aspects of the matter. Dr. Dickinson has well shown that greater attention on the part of the gynecologists should be secured.

There is another field open; namely, a greater correspondence of effort between those who treat the male and those who treat the female suffering from venereal diseases. I think it would be well if our local obstetric societies could have joint meetings with the genitourinary specialists, to take up this important topic.

Gonorrhea is a great deal more important than syphilis, and I differ with Dr. Dickinson in claiming that it is a simpler matter in the male than in the female. The posterior urethra in the male is difficult to treat, and it is because of the difficulty of the treatment and the insidious character of the lesions that the disease itself has become so widespread. The male patient has been neglected. The ordinary man who has had an attack of gonorrhea goes to his physician and in a short time is pronounced cured, and yet I have seen these men several months after marriage come back with exacerbations of an old uncured gonorrhea.

Again, the regulation of prostitution will not solve the problem. We occasionally find women who will not lend themselves publicly to this sort of thing but who are a chronic and constant source of infection, although they cannot be regarded as prostitutes, and it would be difficult to get them to consent to treatment. There is lack of attention on the part of most women to minor degrees of vaginal discharges, to which Dr. Dickinson has called attention. I believe, moreover, that in a great many instances, gonorrheal infections date back to childhood where a vulvitis has caused the infection to center in the cervix where it remains quiescent for years, and after puberty it again becomes evident.

DR. J. WESLEY BOVEE, WASHINGTON, D. C.—I agree with Dr. Dickinson that our best means of treatment is the galvanocautery with the fine wire, such as the laryngologists use in the nose. But that is not the formula that is equally recognized by all workers in this field. There are modifying conditions that have to be considered; for instance, whether the infection is in the lower or upper part of the cervical canal.

Dilatation of the cervix is a necessity as a preliminary to the application of the cautery, whether we do it with or without the aid of general anesthesia. I also think it is better to do too little cauterization the first time rather than too much. It is better to use three or four applications in cauterizing the cervical canal than to overdo it and produce a constriction.

DR. CHARLES C. NORRIS, PHILADELPHIA, PA.—It may sound heretical but it is my firm belief that the average case of cervical gonorrhea undergoes spontaneous cure in three years or less, provided reinfection does not occur. This question of reinfection is an important one and I believe accounts for the marked resistance to treatment often exhibited by this disease.

I am not in accord with the belief that gonorrheal vulvovaginitis frequently persists and causes salpingitis. Gonococcal vulvovaginitis is an extremely frequent disease among female infants and young girls. I believe the infection usually disappears with the development of the lining membrane of the vagina prior to the onset of menstruation. Were such not the case, cases of gonococcal salpingitis developing in girls prior to defloration would be of frequent occurrence. As a matter of fact, gonococcal salpingitis is a relatively rare disease in the presence of an intact hymen.

One essential in the treatment of gonorrhea of the lower genital tract in women is to check reinfection. If this cannot be accomplished the success of the treatment is greatly hampered and indeed local applications under such circumstances are almost useless. I have tried almost all the methods of treatment which have been suggested and believe that the genital tract can be made gonococci-free quicker by the use of the cautery than by any other method. It is not enough, however, to treat the cervix; Bartholin's glands and the urethra should be treated also. All these are harboring places for the gonococci, and it is illogical to treat only one of them. For this reason, I prefer to give an anesthetic, lay open and cauterize Skenes' tubules, excise Bartholin's glands, and cauterize the cervix at one sitting. Entire eradication of the gonococci from the lower genital tract can be hastened by judicious postoperative treatment.

The use of the cautery is not without risk; if the integrity of the internal os is destroyed there is danger of an extension upward of the infection. If a mild quiescent salpingitis is overlooked there is danger that cauterization may light up the condition, and finally, occasionally patients may develop quite severe hemorrhage from the cauterized area subsequent to the operation, when the slough separates. For these reasons cauterization should not be performed except by those skilled in gynecologic technic.

DR. FREDERICK C. HOLDEN, NEW YORK CITY.—Where the cautery has been used unsuccessfully, I think it is because the details of the use of the small cautery snare and knife, as perfected by Dr. Dickinson, have not been understood. It is quite essential that the external os be dilated. Very frequently we will find a small os with a large canal above it. If an attempt is made to cauterize in such an instance, one cauterizes the external os too radically, thereby getting more constriction than is needed.

I agree with Dr. Norris that many cases of gonorrhea in women are self-limiting and will cure themselves. I believe that gonorrheal vulvitis in young girls is quite a different disease, in most instances at least, from that of women. Otherwise, I think we would have a great many blind children, because children with vulvitis would convey the infection to their eyes.

DR. EDWARD A. SCHUMANN, PHILADELPHIA, PA.—I agree that gonorrhea seems to be a self-limiting disease, only the aftermath of the condition as represented by adhesions about the tube, constriction, etc., remaining.

A note of warning about the use of the cautery. I think it should not be practiced while gonorrheal endocervicitis is in its acute stage, because while the gonococci are still virulent, mixed infection takes place and the cautery may open up lymph channels and produce a rather severe pelvic cellulitis.

I would like to call the attention of the Society to the gonophage, a substance generated by cultures of the bacteria and which when injected in cases of gonorrhea seems to limit the infection. It seems to be shown definitely that by this new method disappearance of the gonococci can be brought about even though they may be in latent foci. The recent paper of Pelouze and Schofield presents the subject in a most complete and interesting fashion.

DR. JOHN A. MCGLINN, PHILADELPHIA, PA.—I have had a rather unusual opportunity of studying vulvovaginitis in children and I am rather in accord with what Dr. Norris has said about the self-limitation of this disease in children.

At St. Vincent's Hospital, which is a combined maternity hospital and orphanage, we have about four hundred children. I have come to the conclusion that treatment of this condition in children is not of very much use, and all that we can do now is to isolate these children and keep the parts clean. These children eventually become gonococci-free, and they are transferred to another institution so that we are able to follow them until they are 15 or 16 years of age. We find no further evidence of gonorrhea, showing that the condition is not progressive; it stops at a certain time.

At this same institution we have a splendid opportunity of studying gonorrhea associated with illegitimacy. We deliver about four hundred illegitimate women a year, and last year out of that number we had 228 positive gonococcus infections of the cervix. We have learned that it is best not to treat gonorrhea of the cervix during pregnancy, but simply to keep the cervix clean. In the hundreds of these cases we have not yet lost a single eye at that institution, because the eyes are routinely treated at birth. And we have not had a case of blindness.

So far as the treatment of the adult cervix is concerned I am somewhat in despair. We have used almost everything and yet can get negative smears for a short while no matter what treatment we use, and our index of a clinical cure is that we are able to obtain negative smears from the cervix and from the glands. However, the condition is not actually cured, because we find it recurs when these women have gone out and reinfected men, although there has been no evidence of the trouble so far as we could ascertain. We secured negative results in one hundred cases after treatment, but they all came back again. At the present time we are following the method of Dickinson, using the small cautery, and that seems more promising than anything else.

DR. HARVEY B. MATTHEWS, BROOKLYN, N. Y.—It seems to me that the proper way to handle this condition from a prophylactic, as well as from a remedial standpoint, is to have venereal departments in our hospitals and dispensaries; and then to work in closer cooperation with these departments. Dr. Norris made two important statements: first, that gonorrhea is a self-limiting disease, and secondly, that reinfection may occur from the man. Gynecologists cannot treat the infected man properly, but the urologist can, and will, if we will cooperate by referring the case.

DR. CARL H. DAVIS, MILWAUKEE, WISC.—We turned over the treatment of gonorrheal endocervicitis at the Milwaukee County Hospital to Dr. Harold Shutter and started him with the cautery treatment for chronic cases. He has thus far cleared up the infection in over three hundred women. They are not discharged until all evidence of infection from the glands and from the cervix has been eliminated. Our test of that is getting rid of leucocytes and extracellular organisms as well as the intracellular gonococci.

The difficulty with prostitutes is that they may become reinfected within a few hours after they leave the hospital. This is one great drawback in this problem. Private cases may accidentally become infected, but I believe we can clear up gonorrhea in women if coitus can be prevented for a sufficient length of time.

DR. DICKINSON (closing).—Dr. Bovee spoke of the effect of leaving glands untouched. I showed in my paper that three to five millimeters beyond the area treated would show a sterilizing effect.

Everybody believes, as Dr. Norris has said, that in many of these patients the gonococcus will disappear, but will leave behind it, however, a mixed infection, an endocervicitis, lasting over a number of years, and there again the cautery has its place.

DR. I. C. RUBIN, New York, read a paper on **Rhythmic Contractions of Intact Human Fallopian Tubes as Determined by Periuterine Insufflation and the Kymograph, a Clinical, Experimental Study.** (For original article see November issue, page 557.)

DISCUSSION

DR. BROOKE M. ANSPACH, PHILADELPHIA, PA.—There have been 632 cases at the Gynecologic Service of Jefferson Hospital. In 344 the test was positive; in 288, it was negative. We have performed laparotomy in 138 of these patients; 27 others subsequently became pregnant and confirmed our findings by the Rubin test. In these 165 cases of which we have positive knowledge, the observer's report was erroneous in but 3.8 per cent. In five cases regarded as Rubin negative, laparotomy did not disclose any gross tubal pathology. Four of them had retroflexioversion; the other had definite endometrial hypertrophy.

I have no doubt that the kymograph will add to our ability in making accurate diagnoses. So far as unfavorable results following the Rubin test are concerned, there have been almost none, but we have carried out the most careful asepsis and selected the patients with much care. In one instance in which an insufflation was made just preceding dilatation of the cervix, we produced a pneumosalpinx; it was recognized by palpation, and a laparotomy was done immediately. In one case a pneumosalpinx was suspected, but as there was no permission for operation, none was performed, and the condition subsided in a few days. There was one definite inflammatory reaction with elevation of temperature to 101.2° and a definite leucocytosis; this subsided, and the patient was subsequently operated upon.

There was one case of severe pain and fainting about two hours after the test. There was no elevation of temperature or palpable mass and the symptoms subsided (it is assumed that a tube had been distended with gas) within twenty-four hours; there were several other patients who complained of discomfort continuing over a period of two weeks with no severe inflammatory reaction. One of the earlier patients suffered with rather severe shock from the injection of about 700 c.c. of gas. The quantity is now limited to 120 c.c.

So far as the injection of opaque substances into the tube is concerned, we personally prefer 12 to 20 per cent sodium iodide which casts a good shadow, is not expensive, can be used in a burette with attached manometer and carefully regulated pressure. The tubes must have previously been demonstrated as closed. Care must be exercised to exclude air from the tubing and cannula.

A total of seventeen cases has been subjected to uterotubal roentgenography. In four of these cases it was used subsequent to operation and demonstrated already known uterotubal conditions. Nine cases have been operated upon subsequent to roentgenography; all these revealed pathology compatible with that shown by the x-ray film. Any error in diagnosis has been due from misinterpretation of the x-ray film. The remaining four cases have not yet been subjected to operation.

It has been observed that pain is more marked when fluid is injected than when gas is injected; secondly, that any leakage into the peritoneal cavity is liable to be accompanied by marked irritation, as occurred in one case. In this instance, however, the pulse and temperature remained normal, the discomfort subsiding within twenty-four hours.

DR. FREDERICK C. HOLDEN, New York City.—Shortly after Dr. Rubin's contribution to this subject, I began the use of this method at Bellevue Hospital, and thus far have had no morbidity.

Up to that time I had considered it adequate if gas went through the tubes at a certain pressure. Dr. Rubin explained that he had operated upon patients, where gas had gone through, but where there had been no kymographic fluctuations. At operation, such tubes were found adherent along their entire length. This showed that patency of a tube is not in itself proof of its normal function.

DR. ROBERT L. DICKINSON, New York City.—In a study of sterility abroad one naturally searched for those clinics that were doing the Rubin tubal insufflation test. The work in England, I take it, is being carefully done, with due consideration for the patient. The work in Paris is being done in four clinics. I have seen patients treated without gloves, and one would appreciate that if any accidents occurred in that clinic they would not be due to the method but to carelessness. If the method has received discredit in Germany, it is not the method that is to be blamed. No wonder they have had untoward results and are fearful of using it after some of the accidents they have had. These reports do not reach the American literature.

DR. EMIL NOVAK, Baltimore, Md.—I should like to ask Dr. Rubin about the interpretation of these pressure fluctuations, as to excluding the factor of intra-abdominal pressure, especially as modified by respiration. The generative canal is of course in direct continuity with the abdominal cavity through the fimbriated end of the tube, so that it is reasonable to suppose that fluctuations in the intra-abdominal pressure would be registered in the tube as well. The pelvic diaphragm moves up and down with each respiration, just as does the upper diaphragm, as one can readily observe in the speculum examination of women, especially those with relaxed outlets. It seems very possible that these respiratory excursions might influence the pressure curve. I did not notice, on the graphs which Dr. Rubin showed, any marking to indicate the length and frequency of the contraction waves. This might throw light on the origin of the waves. If they are not of the same frequency as respiration, the latter factor could hardly be the important one. If they are due to tubal peristalsis, one would expect them to be infrequent and prolonged, for involuntary muscle contractions, such as those of intestinal peristalsis, exhibit a long latent period, with prolonged contraction and relaxation.

DR. RUBIN (closing).—My paper was, to be sure, experimental in its substance but at the same time with an eye to its clinical value. There are a number of things of clinical importance that will occur to us as we take up this work.

Dr. Novak's question bothered me a great deal and there is one thing in a negative way that will answer that point: In patients that I have personally operated upon where the kymograph showed practically no fluctuations although patency was present, the tubes were adherent. In such a case why does not physiologic intrathoracic and intraabdominal pressure cause fluctuations during the uterine insufflation? The reason for this absence of fluctuations in the manometer is due to the fact, which was brought out by other work that I have been able to do, that the tube is rigid; it is bound down; it is not free to act. Now during insufflation I have repeatedly asked the patient to bear down voluntarily or to hold her breath; to take quick breaths or to breathe slowly and deeply and have then noted the impression of these physical efforts made upon the kymograph. These efforts can be noticed on the drum and are recorded *only when the tubes are patent.* When the tubes are not freely patent a voluntary effort can also register a definite rise in pressure because as soon as the stenosed tubes permit the passage of gas through them into the peritoneal cavity the latter may be compared to a large balloon which is in direct air-tight continuity with the source of the gas pressure at the gas tank. Any motion or pressure on top of that "balloon" by the diaphragm or abdominal muscles will naturally record a change in pressure. This most likely explains the secondary waves of contraction which are noted in the regular kymographic tracings of normal tubal patency cases.

According to Dr. Peterson's early practice I have been able in two patients to introduce the gas through abdominal puncture and that kymographic record is so entirely different from anything that is noticeable by ordinary tubal insufflation that there is no question but that the one is due to respiration and the other to something inherent in the tube itself.

(To be concluded in January issue.)

NEW YORK OBSTETRICAL SOCIETY

MEETING OF MARCH 8, 1927

DRS. ROBERT T. FRANK and S. H. GEIST described **The Formation of an Artificial Vagina by a New Plastic Technic.** (For original article see page 712.)

DISCUSSION

DR. R. T. FRANK, supplementing Dr. Geist's presentation, said that these cases are rather tragic as a rule, because some of these women marry, perhaps without knowing of their great disability, and divorce, of course, is a very common consequence.

On the other hand, we have all encountered young women who are aware of their defect, who are unmarried, and who desire to know whether their disability can be cured. In these cases, heretofore, he hesitated, especially in young women who had no marked sexual desire, to propose either the Baldwin operation or the almost as dangerous and more distasteful Schubert operation.

Dr. Frank wanted to bring out that this woman had libido, and before operating upon her he assured himself of the fact that she had functionating ovaries, by finding the female sex hormone in her blood.

Although there is a liberal amount of covering to the newly-formed canal, it is advisable for these patients to use a speculum at frequent intervals, leaving it in place for twelve hours at least, or they can leave it in place during the night, to prevent the primary contraction which takes place in every scar.

DR. ROBERT L. DICKINSON read a paper entitled **The "Safe Period" as a Birth Control Measure.** (For original article see page 718.)

DISCUSSION

DR. R. T. FRANK said that these studies will enlighten and perhaps show us that there is really a safe period and it must be seriously considered. In analyzing human material we meet with extremely many difficulties.

Dr. Frank felt inclined to venture the opinion that the acme of sex desire in the human female corresponds to the time when most of the hormone is circulating in the blood just before the onset of menstruation. Possibly within a short time we may be able to show more positive evidence by injecting an active hormone into frigid women and seeing whether any corresponding stimulation of the sex desire occurs. In further analysis we must remember that while the ovum is going down in the tube the spermatozoon must be ascending, and we have to keep in mind, then, the time of viability of these two structures. The evidence is somewhat conflicting. Dr. Frank believed that in the closed follicle before its rupture, the female sex hormone is enclosed in the follicular sheath. With the rupture of the follicle this concentrated hormone is poured out into the peritoneal cavity and is rapidly absorbed. Furthermore the corpus luteum continues to secrete the hormone, and pours it out into the blood-stream. Bearing this in mind, it would appear that ovulation occurs about as follows: Four days for menstruation in a 28-day cycle; that leaves 24 days. The hormone is demonstrated in the blood, as a rule, about 10 days before the expected period, and that comes very closely, then, in correspondence with the anatomic findings that ovulation (rupture) occurs about two weeks after the completion of the preceding period.

However, although our increase in knowledge in the last few years has been very rapid, Dr. Frank did not believe that we would settle the question in the human female definitely, especially for each given case (because each woman is a law unto herself) until we get the vaginal spread method to the point that it applies to the human female. If the epithelial lining of the vagina and consequently the spreads we obtain in the vagina, can be formulated to give us an idea of what is going on in the ovary, then we will be in position to do so; but the fact that in a large series of cases (from 7 to 10 per cent) impregnations took place in the least fertile period makes it very likely that there is no real safe period in the human female, and that if the very necessary birth control is to be established on a firm and workable basis it will depend upon the elaboration of some mechanical or chemical means of preventing conception.

DR. JOHN FRASER, Montreal, Que., (by invitation) presented a paper entitled **The Ovary in Osteomalacia.** (For original article see page 697.)

DISCUSSION

DR. R. T. FRANK said that the subject is a tremendously involved one. One reason is that osteomalacia is not confined to the female sex, for an identical condition occurs in the male in the regions in which female osteomalacia is also encountered, with a remarkable degree of frequency.

The second impediment in studying this condition is the fact that osteomalacia is a disease characterized by marked exacerbations and remissions which misled Bossi, for example, into believing that adrenalin was a cure for this disease. He probably was encouraged by meeting frequently the period in which the patient normally, if you can use this term in connection with a pathologic process, would improve with or without treatment.

The third reason is that castration may act specifically, as perhaps we may find out at a later time, when the problem is clarified, but mainly because it abolishes pregnancy once and for all. As we all know, during pregnancy these patients, whether it is simply that they are inclined to osteomalacia, or whether it has been latent in them, as seems likely, have their most active period of the disease.

The one impression gained from Dr. Fraser's paper was that this problem will not be cleared up by morphologic study, but that it may be cleared up by intensive physiologic and pharmacologic investigation.

Dr. Fraser used the term ''periglandular tissue,'' because ''interstitial gland,'' which he only mentioned once in order to sum up this whole tissue, is very likely a misnomer; but at the present moment some work of Zondek's, in Berlin, has made us revise, at least temporarily, our opinion about this perifollicular tissue. Zondek by a very clever series of experiments, implants minute portions of the ovary, which he examines under the microscope, in castrated mice. By this means he believes he has shown that the thecal tissues, which are the same thing, namely, the tissue surrounding the follicle, appear to bring on a positive reaction in these castrated mice. If that is the case, we shall have to pay much more attention to this tissue in the future than we have heretofore. After many anatomic and morphologic studies, which may have misled us, we have gradually come to the conclusion that it is the glandular cells,—the interior lining, and not the exterior,—which are the active ones. If you remove from the ovary the corpus luteum and the large follicles that can be removed (the small ones cannot be removed) and extract the residue, its activity is greatly reduced, which is against the theory that the interstitial tissue is active.

This same Zondek has found that a problem in sex physiology, which has puzzled us completely hitherto, appears to be solvable and solved: Why does puberty set in? Apparently, an active extract of the pituitary gland at once starts an ovarian activity, a most startling fact, which is the first real proof encountered by Dr. Frank of the so-called interrelation of gland activity.

DR. FRASER (closing) said that the whole thing is in the melting-pot, and he has come to the conclusion that although he did not know anything about it, he liked to talk about it. He had the feeling that once in a while here in this country, although we do not see osteomalacia, we do see these peculiar malposed pelves which are not caused by rickets, and it is possible—it is only possible—that some of them represent a mild change which we can cloak under the term of disturbed metabolism.

DR. S. A. COSGROVE, Jersey City, N. J., read a paper (by invitation) entitled **Spinal Anesthesia in Obstetrics.** (For original article see page 751.)

OBSTETRICAL SOCIETY OF PHILADELPHIA

STATED MEETING JANUARY 6, 1927

DR. BERNARD MANN reported a Fatal Case of Hypernephroma.

Mrs. S. B., white, aged forty-two years, admitted to the Mt. Sinai Hospital, June 3, 1926. For the past year she complained of pain in the entire upper abdomen. For four months, the attacks were so severe that the patient was limited in her activities. For the past four weeks, she was confined to her bed because of the pain and general asthenia.

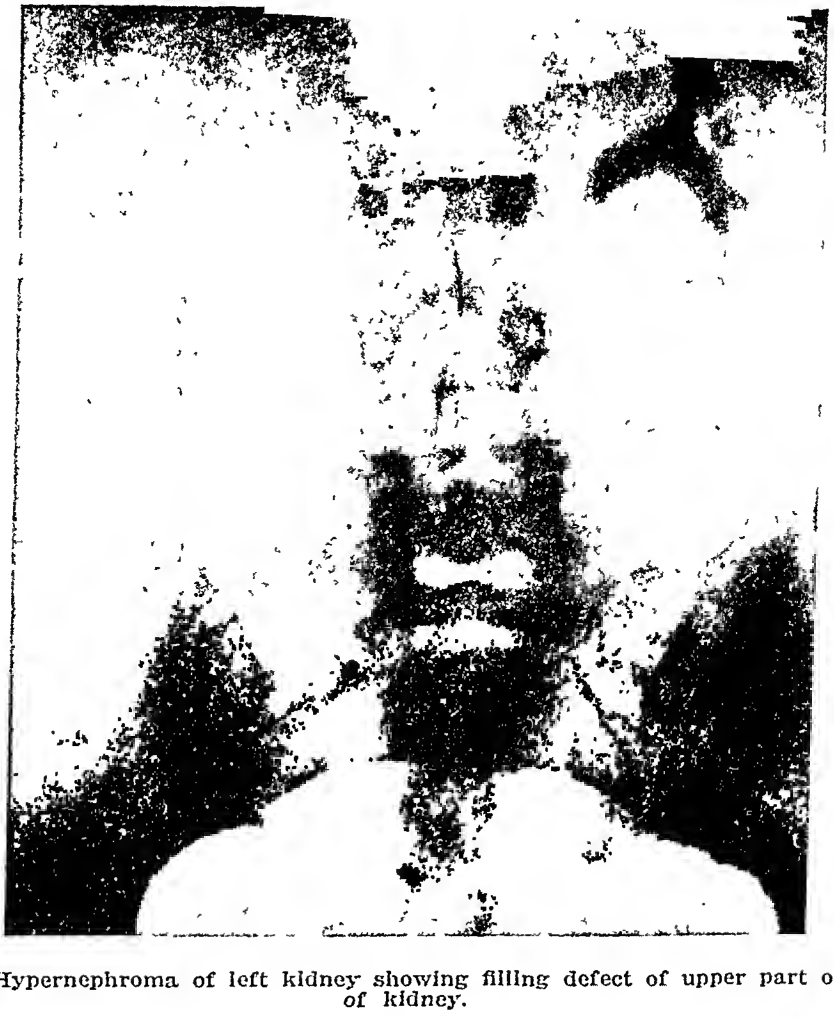

Fig. 1.—Hypernephroma of left kidney showing filling defect of upper part of pelvis of kidney.

The skin had a yellowish tinge, the conjunctivae were also yellowish. There were visible pulsations of the vessels of the neck. The lungs were negative. The heart was enlarged to the left, and a loud, rough systolic murmur was heard at the apex and transmitted to the left axilla. Abdominal examination revealed an enlarged liver and a subdiphragmatic mass in the left upper quadrant. This mass was fixed and quite tender to palpation. Her appetite was poor, and she was nauseated after meals. She lost fifteen pounds in the past two months.

The temperature on admission was 102° F., and pulse 110, which continued during her stay at the hospital. There was no history of bloody urine. The hemoglobin was 55 per cent; R.B.C., 3,100,000; W.B.C., 9,600. Wassermann test was negative; urea nitrogen, 16; blood sugar, 120; icterus index, 17; platelet count, 40,000 per cubic millimeter. Blood culture was negative. The gastric analysis showed an achylia.

The cystoscopic examination revealed a congested bladder, capacity 250 c.c. Both ureteral orifices appeared normal. A No. 6 catheter met with no obstruction on its way to the pelvis of the kidney on either side. The urine collected from the right kidney, contained W.B.C. 1 per H. P. field, granular and hyaline casts; left kidney, W.B.C. 12 per H. P. field. There were few R.B.C. and many epithelial casts. A week later, the ureters were again catheterized, this time blood was seen escaping from the left ureteral orifice before an attempt was made at catheterization. The specimens of urine collected showed the following: Left kidney: bloody-colored, many W.B.C., and very many R.B.C. Right kidney: granular and hyaline casts, no R.B.C., no W.B.C. The urine from both kidneys was sterile. Both kidneys were injected with 12 per cent sodium iodide solution. The pyelogram revealed a filling defect in the upper part of the left kidney. (Fig. 1.) The lower calyx was large and blunted, and the minor calices were obliterated. The outline of the left kidney appeared larger than normal. The right kidney was normal.

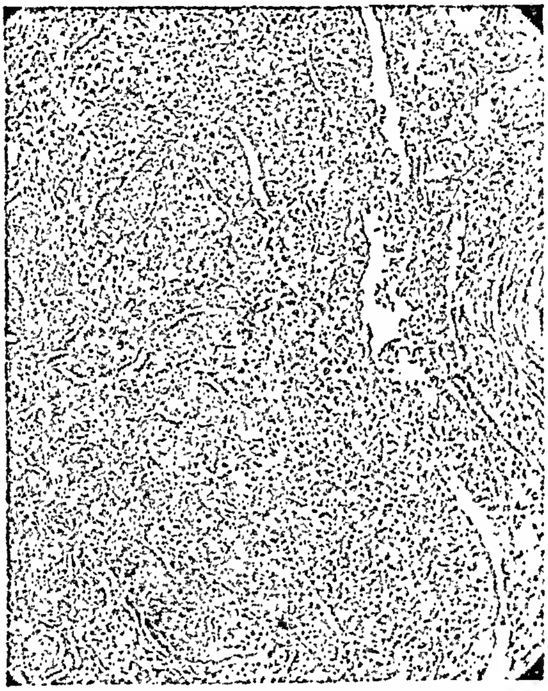

Fig. 2.—Hypernephroma of kidney showing characteristic large clear cells.

Patient died July 20, 1926. Postmortem examination showed the right kidney the seat of cloudy swelling, the left kidney much larger than normal, atypical in its upper half being very much larger than the lower, and irregular in its outline. The capsule was adherent. The cut surface showed a large tumor mass involving the entire upper part of the kidney, yellowish in color, and fascicular in structure. A section of this kidney showed the tubules very markedly dilated, with areas of leucocytic infiltration. (Fig. 2.) The tumor mass showed a picture of a typical hypernephroma. In both lungs, nodules were found, varying in size from that of a pea to that of a cherry, which on section proved to be metastatic hypernephroma. (Fig. 3.) The liver was larger than normal and was the seat of a chronic passive congestion. The spleen was twice the normal size and was the seat of chronic passive congestion.

This case presented some difficulties in diagnosis. Fever is not frequently observed. It was present only once in twenty-five cases of hypernephroma studied by Pleschner. The gastric symptoms and the enlarged liver pointed to a gastrointestinal condition. The mass in the left upper quadrant was thought of as being a carcinoma of the splenic flexure. The fact that she had no bloody urine, and the first ureteral catheterization was negative for blood seemed to indicate a renal tumor.

The pyelogram is a very important aid in the diagnosis. It will frequently reveal a characteristic deformity of the renal pelvis. The roentgen-rays may reveal the outline of the tumor mass, which is very suggestive, especially by comparison with the normal shadow, if obtainable, of the healthy kidney.

This case proves the necessity for thorough urologic study, including pyelography and repeated examinations in every case of obscure abdominal disease.

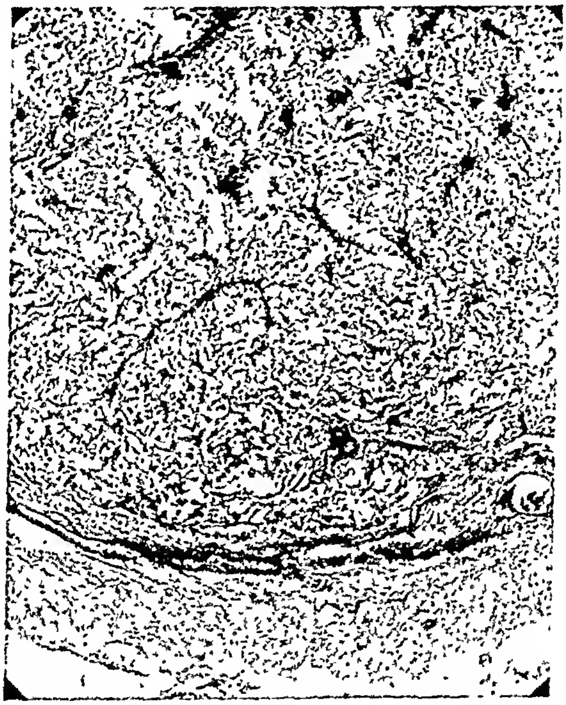

Fig. 3.—Section from nodule taken from lung showing characteristic hypernephroma cells.

Dr. George W. Outerbridge reported the following cases: (1) **Ovarian Abscess Communicating With the Bladder**, and (2) **Curious Malingering in a Case of Ureteral Calculus.**

Case 1.—Mrs. J. M., aged thirty-one years, gave the following history: For the previous eight years she had had gradually increasing hematuria. Usually only a few drops of blood were noted, but at times the patient voided almost pure blood. There was great frequency of micturition. In the preceding June she had, upon one occasion, been unable to void, and was about to be catheterized by her physician, when she spontaneously passed a large clot and was then able to void normally. About six months before, the cystoscope showed a moderate cystitis and urethritis, but nothing further, specimens of urine obtained by ureteral catheterization being entirely negative.

Examination of bladder urine on October 3 showed a large amount of pus, few red blood cells, and bladder capacity of three ounces. The irrigating fluid at first brought out large white flocculent masses, but soon became clear. There was marked congestion of the trigone and fundus, with patches of intense scarlet congestion around the right ureteral orifice and on the right lateral wall, from which it seemed probable the hemorrhage might be coming. Both ureteral orifices were edematous and congested. Bladder irrigations and instillations of neosilvol relieved the patient's subjective symptoms somewhat, but pus and blood were still present in the urine.

A second cystoscopic examination on October 27 showed the bladder capacity to be six ounces. Otherwise the findings were the same as before, except that the areas of congestion were not quite so marked. Both ureters were catheterized and a good flow of pale, clear urine was obtained from each side. These urine specimens were entirely negative, showing neither pus nor blood, and were sterile on culture. Phthalein, given intravenously, was eliminated on each side in three and a half minutes. In one-half hour, 8.5 per cent was obtained from the right side and 17.5 per cent from the left. Except for this apparent reduction in function on the right side, the examination was thus negative so far as the kidneys were concerned, and not until a third cystoscopy was the true nature of the trouble discovered.

At this third cystoscopic examination, on November 21, the bladder capacity had increased to eight ounces. The catheterized bladder urine was very cloudy, with small blood clots and large flocculent masses. The trigone, ureteral orifices, and areas of congestion were as before, except for increase in the edema. On depressing the ocular end of the cystoscope to the extreme limit possible, so that the instrument assumed an almost vertical position, there was seen on the posterior wall of the bladder, somewhat behind the air-bubble and to the right of the midline, what looked like a small irregular defect in the bladder wall, from the center of which a thick streamer of pus was hanging. On removing the cystoscope and making a bimanual examination, a distinct tender mass could be felt in the right vaginal fornix, which was diagnosed as a pyosalpinx or ovarian abscess. This either had not been so marked, or had been entirely overlooked at an examination made when the patient was first seen in October.

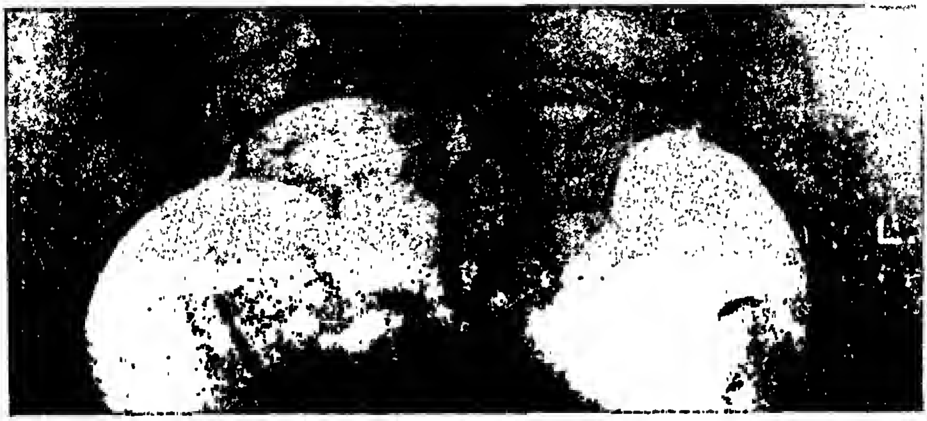

Fig. 1.

At a fourth cystoscopy, November 25, made in order to confirm these findings, the same area on the posterior bladder wall was seen, but no pus was exuding from it. An attempt to make pressure through the vagina on the right adnexal mass while looking through the cystoscope, to see if any pus could be forced through the fistula, was unsuccessful. However, after removing the cystoscope, making bimanual pressure on the mass, and then reinserting the cystoscope, a long streamer of pus was seen hanging into the bladder from the fistula. Considerable hemorrhage, which had also occurred, interfered somewhat with this second view.

An opaque ureteral catheter was then introduced into the fistulous opening, through which it could be passed for about 3 or 4 cm. The bladder was then filled with sodium iodide solution and a roentgenogram made (Fig. 1), which shows the dome of the bladder and the catheter passing beyond the limits of its wall to the right of the midline, thus absolutely confirming the diagnosis of an extravesical mass communicating by a fistula with the bladder and discharging pus into it. The blood was undoubtedly accounted for by the high-grade cystitis set up and maintained by the constantly recurring pus evacuation into the bladder.

The previous failure to find the fistula was undoubtedly due to its location high on the posterior wall, a situation that may truly be considered a "blind spot" in regard to examination with the ordinary type of indirect vision cystoscope, whose angle of view is at approximately right angles to the shaft. Unless the greatest care is taken both to elevate and depress to the utmost the outer end of the cystoscope while revolving the shaft to make visual sweeps around the bladder walls, this area will often be missed entirely, as had undoubtedly been the case here.

A few days subsequent to the last examination noted above, this patient was operated upon at the University Hospital by Dr. John G. Clark, who found a thick-walled abscess of the right ovary directly communicating through a fistulous opening with the posterior wall of the bladder. He removed the ovary and resected the portion of the bladder wall involved in the fistula. The patient made a good recovery.

CASE 2.—On January 17, 1923, Mrs. M. P., aged twenty-five years, was referred because of severe pains in the left lower abdomen. Pelvic examination was negative. Cystoscopic examination showed an essentially normal bladder. Indigocarmin given intravenously showed strong elimination from the right side in three minutes; very feeble elimination from the left side in about ten minutes. A catheter was easily passed to the right kidney, but on the left side it was impossible to pass one of any size farther than about 3 cm. above the ureteral orifice, and the x-ray showed an oval shadow just at the tip of the obstructed catheter. (Fig. 2.) A diagnosis was made of impacted calculus near the lower end of the left ureter. Three or four repeated cystoscopic examinations within the next month and numerous x-ray examinations, all resulted in identical findings, except for the fact that on subsequent examinations the indigocarmin elimination on the left side, while never quite equalling that on the right, became markedly improved, so that we felt justified in persisting in efforts to induce passage of the calculus. Attemps to dilate the ureter by the passage of a catheter or bougie beyond the stone uniformly failed, obstruction at about 3 cm. above the orifice being constant. Upon one occasion, a Bransford-Lewis metal dilator was passed up to the stone, and the ureter thoroughly dilated below this point, in the hope of inducing the stone to pass, but without avail.

After having pursued this course of treatment for about a month, the patient was told that operation would be necessary for removal of the stone. She became greatly agitated at this, objected strenuously, and on February 20 insisted on leaving the hospital, which she was permitted to do after being carefully instructed to examine all urine passed and to report at once if she voided anything resembling a small stone. About a week later she reported by telephone that she had done this, and on March 7 she returned to the clinic with the stone that she claimed to have passed. This was in fact just about the expected size and shape, but looked entirely unlike any ordinary type of renal or ureteral calculum. It presented the appearance of a smooth, hard, oval pebble, such as one might pick up on the beach or in a gravel pit. Examination of the patient showed the left ureteral orifice somewhat gaping (probably a result of the previous dilatations), but the edges were smooth, and did not look as if a foreign body had recently passed through. Indigocarmin elimination was about equal in time of appearance and volume on the two sides, suggesting that possibly the obstruction had been relieved. On attempting to pass a catheter, however, it was arrested at the same point as before, and an x-ray showed the same shadow as previously seen. From these findings we felt certain that the patient was practicing a deception for which the only conceivable motive apparently was to induce us to tell her that she did not need an operation.

Having the old pain again, she was readmitted to the hospital six months later. X-ray showed the same shadow in the same place as before. A catheter was arrested at 3 cm. on the left side as before, but after a little manipulation it suddenly slipped past the obstruction and then went on up to the kidney pelvis. A pyelogram showed only a very moderate dilatation of the pelvis and slight blunting of the calices, in spite of the long-continued partial obstruction in the lower ureter. The following day a second catheter was passed alongside the first one, and these were allowed to remain in the ureter for several days in the hope that sufficient dilatation might be caused to induce the passage of the stone. An attempt to insert a third catheter failed, and the stone did not pass.

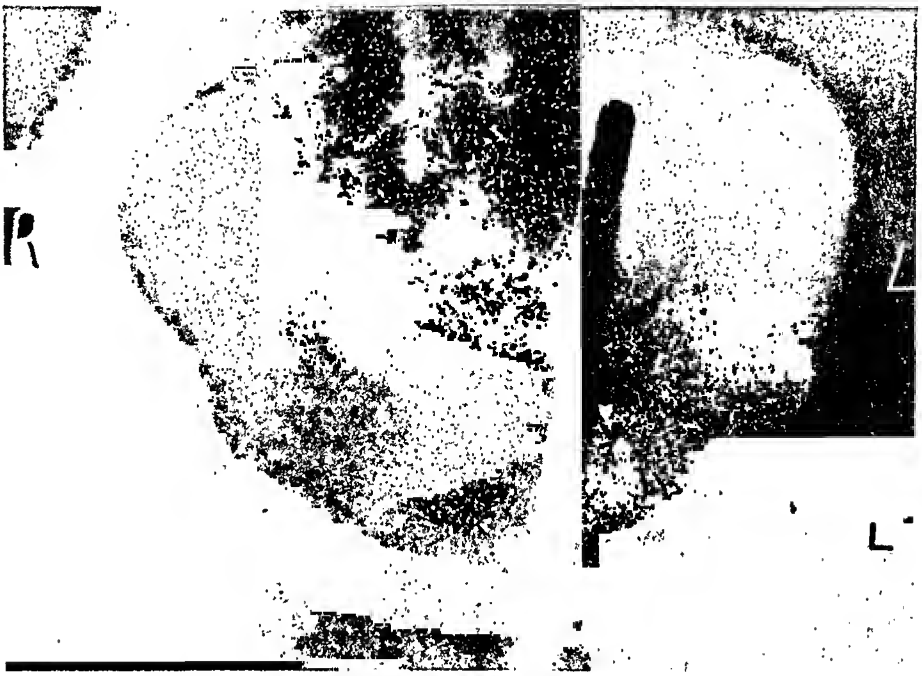

Fig. 2.

The patient now earnestly requested operation, which was performed on September 5, the ureter being exposed extraperitoneally through a Gibson incision. The stone was easily felt, and was removed in the ordinary manner through a longitudinal incision in the ureteral wall. Beyond the fact that a sinus developed which required a few injections of bismuth paste to secure healing, the patient made an uninterrupted recovery.

Dr. George M. Laws described **The Technic of Dilatation of the Ureter.**

The object of treatment is to restore permanently the lumen of the canal. Divulsion is unsurgical in that it wounds the tissue and invites the formation of a cicatrix. Gradual dilatation may be intermittent or continuous. White and Martin taught us that the passage of an instrument through a stricture results first in hyperemia. Hyperemia is followed by softening and absorption of the inflammatory exudate and by atrophy of the fibrous deposit. The reaction lasts several days. With this conception it is logical to practice the plan of gentle, intermittent dilatation for the inflammatory and the congenital strictures and to reserve rapid dilatation for the calculi. Experience has shown that the dilatations should be gentle and that one should not attempt to do too much at one time or the reaction may be severe. The Gareeau catheter and the silk bougie are the instruments of choice for routine work.

For rapid dilatation below a calculus the Buerger olives have been fairly satisfactory. The newer bags of Dourmashkin promise to be more efficient.

In order to remove a calculus after dilating below it Dr. Laws devised the plan of extracting it with multiple bulbs. For this purpose he made a set of bulbous, olivary tipped, whalebone, ureteral bougies. They proved successful. The bulbs have more often been used in the Gynecologic Service of the Presbyterian Hospital for strictures and minute ureteral orifices. The operator feels the "hang" and locates the obstruction accurately. By pulling instead of pushing he is more confident of safety and knows how much force he employs to effect a certain degree of dilatation.

Those who prefer the dorsal position and a fluid medium to the knee-chest position and air distention of the bladder have had technical difficulties to meet in dilating the ureter beyond 12 Fr. The problem has been simplified by passing first one of the whalebone, bulbous bougies beyond the area of obstruction and then a Gareeau catheter alongside it. Traction on the bulb effects dilatation to an extent depending upon the level at which the Gareeau catheter is held.

DISCUSSION

DR. LEON HERMAN believed that whalebone bougies designed by Dr. Laws, in the hands of a man of experience like Dr. Laws, are, no doubt, perfectly safe, but, in the hands of those less skillful, must be extremely dangerous, as it would be very easy either to make false passages in the ureteral walls at the site of a stricture or actually to perforate the ureter. Dr. Noble reported a case some years ago in which he passed a ureteral catheter through the ureter at the site of the stricture, the coiled-up end of the catheter having been found among the intestines at the time of operation. Impacted ureteral stones cause varying degrees of ureteritis and periureteritis, and both of these processes are markedly increased by the trauma incident to attempts to remove the stone by instrumental means. Dr. Herman did not mean that instrumental removal of ureteral stones should not be attempted, for cystoscopists succeed in removing 85 per cent of impacted stones, but in these cases in which failure with the method results, the inflammatory pathology at the site of the stone is greatly increased as a result of it. Several personal experiences lead him to believe that very careful discrimination is necessary between cases of impacted ureteral stones that should be operated upon at once and those in which one or repeated efforts at instrumental removal should be made.

DR. LAWS (closing) said that the method referred to was not intended for routine treatment of ureteral calculus, but it has been a valuable addition to the treatment of ureteral stricture.

DR. CHARLES MAZER read a paper on **Ureteral Stricture.** (For original article see page 761.)

The Readers' Forum

CONDUCTED BY JOHN OSBORN POLAK, M.D.

Readers of the Journal are urged to avail themselves of the facilities afforded by this department for replies to questions in the domain of obstetrics and gynecology. All inquiries should be directed to Dr. John O. Polak, 20 Livingston Street, Brooklyn, N. Y. Replies to such inquires will be published as soon as possible in this department.

Editor.—How soon after birth of the child would it be advisable to repair cervix cystocele and rectocele?

What is your belief concerning the use of pituitrin in the induction of labor?

E. B. VOGEL,
BELLEVUE, OHIO.

Doctor.—The repair of childbirth trauma is an accepted principle, but the time for such repair is still a question of debate. Theoretically, the immediate suture of all obstetric lesions is ideal and should give pleasing results. Practically, however, owing to the severe tissue trauma and the usual accompanying edema, there is interference with the perfect union.

In all extensive injuries occurring in primiparae our best results have been obtained by waiting twenty-four hours, for, even in this short time the edema more or less disappears, the injuries can be better exposed, and their extent more readily appreciated; hence, the coaptation is more perfect, and suture constriction may be avoided. The most aseptic technic, of course, is imperative.

Bubis, of Cleveland, has, for many years, advocated and practiced the repair of the cervix, and the correction of cystoceles and rectoceles, by plastic operation immediately after labor, in multiparae who have been the subjects of previous obstetric injuries. His results have been excellent, but it must be remembered that he has rare technical skill. We have given his method a fair trial and can frankly state that plastics on the cervix at this time result in a smooth, conical cervix which favors uterine involution. The cystocele and rectocele repairs, however, have not given such excellent results. We have therefore postponed these operations in the afebrile case until the seventh day when the edema and vascularity of the tissues are less and the line of cleavage may be more readily discerned. A further advantage is that the uterus has undergone considerable involution and is less likely to become retroverted or retroposed than when the procedures are done at an earlier date, as it must be remembered that the vaginal walls and ligaments participate in involution.

Birth injuries left uncared for lead to chronic invalidism from prolapse, displacement, and menstrual disturbances and predispose to local irritation or faulty drainage which, in turn, favor the development of cervix cancer.

Pituitrin for the induction of labor has many advocates, but it is not without danger to both child and mother. Extensive trial has shown that it is more or less unreliable in producing continuous rhythmic contractions. Different individuals have different susceptibilities to the effect of pituitrin; we have seen the uterus go into spasm from *five* minims and cause fetal asphyxia; we have also seen premature separation of the placenta occur from the employment of ½ ampule given hypodermically in the first stage of labor. From these experiences we feel that the employment of pituitary extract to induce labor is hazardous, and in view of the fact that we have so many excellent methods that are relatively safe we would advise that the best place for pituitary extract is in the third stage of labor rather than to induce it.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Radiology

Borak: Treatment of the Pituitary and Thyroid Glands by X-Ray for Loss of Ovarian Function at the Climacteric Period. Münchner medizinische Wochenschrift, 1924, lxxi, 864.

Patients of this type present a rather constant and usual picture as a result of the loss of ovarian function. At first there may be a definite increase of weight or a loss together with a transitory or persistent rise of blood pressure. Vasomotor symptoms are pronounced and there may be hot flashes, dizziness, a feeling of faintness, flashes before the eyes, dyspnea together with profuse perspiration over the body. There may be headache, migraine, peculiar pains of the muscles, eructations, constipation, pruritus especially of the vulva, parasthesias of the extremities.

Borak has treated 47 patients with favorable results, the pituitary body being radiated in 35 cases and the thyroid in 12. Other parts of the body, if radiated, apparently did not influence the results at all. A. C. WILLIAMSON.

Recasens, S.: X-Ray Therapy in Endocrine Disturbances of the Sexual Apparatus. Medizinische Klinik, 1924, xx, 810.

Roentgen rays in large doses have been used to destroy malignant tumors, but now small doses of the x-ray are employed in cases of disturbed function of the genital apparatus due to insufficiency of the endocrine glands. The author has treated many amenorrheic patients with small stimulative doses of x-ray and is very well satisfied with the results, especially in young women. The application is made in the region of the ovaries, and 20 per cent of the erythema dose is used and repeated a month later.

More frequently than simple ovarian insufficiency, one finds associated with it an insufficiency of the hypophysis. These cases of amenorrhea are often confused with pregnancy, for the abdomen enlarges. In these cases good results were obtained by radiation not only over the ovaries but also over the hypophysis.

The results for dysmenorrhea were not as good. In these cases the fault is in lack of development of the anterior uterine wall, in consequence of which there is a pronounced anteflexion. The basic cause, however, is a diminished activity of the ovaries; hence, it is logical in these cases of dysmenorrhea to stimulate the ovaries. The best time to do this is before the twentieth year.

Ovarian insufficiency is frequently associated with hyperthyroidism. These patients have in addition to oligomenorrhea, vasomotor disturbances, headache, insomnia and palpitation. Here x-ray treatment of the ovaries and the thyroid is of great help.

In severe cases of metrorrhagia massive doses of x-ray are employed to produce roentgen castration. But there are cases of metrorrhagia associated with marked anemia which are not attributable to the gonads. These cases are best treated with the application of x-ray to the bone marrow. By this means one produces an increase in the number of blood cells and the disappearance of the thrombopenia, which are the true causes of the blood loss.

In Doederlein's Clinic, the hypophysis is x-rayed to stimulate uterine contractions during labor. Since the action here is only temporary Recasens prefers to use pituitrin for the same purpose. J. P. GREENHILL.

Hirsch, I. Seth.: X-Ray Treatment of Ovarian Hypofunction, Surgery, Gynecology and Obstetrics. 1926, xliii, 659.

The results of radiation treatment led to the conclusion that a certain dosage in carefully selected cases is capable of producing improvement in ovarian function, as shown by the regulation of the menstruation and the induction of pregnancy with the birth of healthy children.

There cannot be any objection to this form of treatment on grounds that the already diminished ovarian activity can still further be diminished by the small doses of radiation. If the condition of the ovary is such that this should actually take place, nothing is lost for such an ovary is incompetent to produce the menstrual mechanism or to produce an ovum capable of fecundation.

WM. C. HENSKE.

Szenes, A., and Palugyay, J.: Radiation of The Hypophyseal Region For Ovarian Hypofunction. Wiener Klinische Wochenschrift, 1925, xxxviii, 503.

Following the reports of Borak and of Sahler and Werner, the authors treated 38 patients in whom the menopause had been artificially produced by x-ray therapy, by radiation of the hypophyseal areas in order to bring about an amelioration of the symptoms. In 8 cases, 21.1 per cent, all symptoms disappeared in from two to three weeks following the series of treatments; in 24 cases, 63.1 per cent, the symptoms were markedly decreased; in 3 cases, 7.9 per cent, there was no change and in 3 cases, 7.9 per cent, the symptoms were increased. Subsequent examinations of 25 of these cases, three months following the treatment, showed over one-half to be free from symptoms or markedly improved. The relief following the third treatment was double that following the first treatment and following the fifth treatment was triple that following the first. Profuse sweats had been present in 24 cases and 16 had been markedly improved or had lost them entirely following the treatments. Four cases, which previous to radiation had not been troubled by sweats, developed them after the treatments. Of the 28 cases suffering from headaches, one-half were benefited, and in one case the headaches increased after treatments.

The authors recommend radiation of the hypophysis for menopausal disturbances but warn against too strong a radiation and insist on a careful clinical control of the symptoms, since some patients are made definitely worse by the treatment. They suggest that if no relief is obtained after the third radiation, the thyroid gland should be given a mild x-ray exposure and the patient should then be allowed to rest from six to eight weeks before repeating the treatments.

RALPH A. REIS.

Uter: Roentgen Therapy in Tuberculosis of the Peritoneum and Genitalia. Zentralblatt für Gynäkologie, 1924, xlviii, 1473.

This treatment has been adopted in a number of the German clinics, and presupposes a dosage insufficient to cause amenorrhea by its action on the ovary, the percentage of cures being higher where such amenorrhea is not induced.

The author analyzed the results in some twenty-four cases, and gives evidence of the value of the treatment. There is no mortality, and there are no resultant fistulae. There is an appreciable improvement in the local and general condition and usually an increase in body weight. Where a diagnosis of tuberculous peritonitis is certain, no other therapy is indicated. Where necessary, the treatment may be undertaken subsequent to a conservative exploratory operation. LITTLE.

Heyman, H. V. James: Technic and Results in the Treatment of Carcinoma of the Uterine Cervix at "Radiumhemmet" Stockholm. The Journal of Obstetrics and Gynaecology of the British Empire, 1924, xxxi, 1.

In eight years previous to 1922 five hundred and five cases of carcinoma of the cervix were treated by radium unaccompanied by efforts at surgical removal. Previous to 1918 about 91.2 per cent of cases were inoperable or of the borderline type. Since 1918 the inoperable and borderline cases constitute only 68.4 per cent of the material. Nineteen per cent of cases were forty years of age or less (a highly malignant group). Twenty per cent of all cases, 16.6 per cent of the inoperable cases and 40 per cent of the operable cases treated previous to 1919 were alive five years later. All deaths occurring are considered as due to cancer.

As a rule two or three applications of radium are given in five weeks' time. Radium is placed both in the uterus (average total dose 2220 to 2640 mg.) and in the vagina (average dose 4500 mg.) The radium is filtered through 3 to 4 mm. of lead. All operative interference such as cauterization, excochleation and frequent biopsy is absolutely contraindicated. Treatment is never repeated in the first six months. Only one application is made if there is a recurrence at this time. If there is a local recurrence and the growth is operable, hysterectomy is done. Roentgen irradiation is used in conjunction with radium treatment if there are extensive glandular metastases, in the presence of recurrence in the parametria or where severe pain follows radium treatment.

Local recurrence, if it occurs, takes place usually within one year. Metastasis may follow years of apparently good health. In the absence of palpable recurrences, pain, anemia and fever usually indicate cancer tissue somewhere in the pelvis. Rectal complications following radium are usually due to an overdose and manifest themselves in tenesmus and hemorrhage about six months after treatment. The bladder is more resistant to an overdose than the rectum. There is a primary mortality of 1.19 per cent associated with the use of radium. Five of the author's patients died of general peritonitis and sepsis and one of pulmonary embolism. Changes in technic, larger doses over shorter periods, less frequent and meddlesome treatment and the accumulation of experience, are factors in the improved results seen year by year. H. W. SHUTTER.

Gagey, J.: Curietherapy of Operable Cancer of the Cervix. Bulletin de la Société d'Obstétrique et de Gynécologie, 1924, xiii, 22.

Gagey reports 14 cases of cancer of the cervix which were operable but which were treated by radium alone during the years 1919 and 1920. He believes that after a lapse of three years or more, recurrence is unlikely. Information concerning 10 of these patients was obtained in January, 1924, and 9 of the 10 were found to be alive and well. The tenth had died, seven months after radium treatment, of extension of the carcinoma into the parametrium and the rectum. In this group the number of spinal cell carcinomata which were cured equaled the number of basal cell carcinomata. In all the cases relatively small doses were used (about 20 millicuries with primary filtration of only ½ mm. of platinum). The only case where more filtration was used was the one which had the recurrence which ended in death. In one patient treated by the above technic there was *restitutio ad integrum*, for the patient later became pregnant and carried to term.

Another series of 10 cases was followed in which operation was performed soon after radium therapy. In these cases instead of the Wertheim operation, a total hysterectomy was performed because the author believes that if recurrences do take place they are usually found in situ rather than out in the broad ligaments. Of these 10 patients who were operated upon during 1920, eight were followed. Three of the latter had died soon after operation and one other patient died in 1923 of metastases. The results for the patients treated by hysterectomy were therefore much inferior to those treated by radium alone. The problem, however, is complex, for in three of the cases operated on after radium application active cancer cells were found.

Judging from these results, the author is tempted to treat operative cancer of the cervix by radium alone. Since, however, radium treatment a few weeks before operation does not render the operation more difficult and since the radium always sterilizes the uterus, one should combine radium therapy with operation; for some patients were saved who could not have been cured by radium alone. The author gives this as his opinion despite the unfavorable results which he had from such a procedure. J. P. Greenhill.

Smith, Wm. Sidney: Gynecologic Conditions Treated With Radium Alone or Combined With Surgery. Surgery, Gynecology and Obstetrics, 1925, xl, 598.

Radium, heavily screened with one millimeter of platinum and two millimeters of rubber and used within the uterus in 1200 to 2400 mg. doses, even with repeated administrations, causes no untoward effect on bladder and rectum and produces very little troublesome leucorrhea. The temperature reactions occasionally seen are more likely due to a fresh invasion by organisms started by the curetting and blocked drainage than to radium. Radium alone is an excellent treatment for chronic metritis and small fibroids at the menopause age, curing most of the cases with one 1200 mg. dose, but even a 2400 mg. dose will not always control the bleeding indefinitely in all patients. Plastic operations on cervix and perineum may be performed with excellent results at the same time that radium is applied to the interior of the uterus. For advanced cases of cancer of the cervix and corpus, radium, as a palliative measure, gives more relief than any other treatment at our command. In early cervical cases, the cautery operation and radium at the same session, with or without x-ray treatment later, give results which are so valuable that the combination should be thoughtfully considered as a possible standard method of treatment. Wm. C. Henske.

Cheval: Vesicovaginal Fistula Occurring 48 Hours After Radium Application. Bruxelles Médical, 1925, v, 5.

Patient, 44 years old, had severe hemorrhages. Examination showed carcinoma of the cervix the size of a hen's egg, with slight broad ligament involvement. Cystoscopy showed bladder irregularity and congestion but no neoplastic growth or ulceration. The patient received 10800 millicuries of radiation in the region of each broad ligament, over a period of five days, and 21600 millicuries in the vagina, over a period of nine days. In each case the radium was filtered by 1.5 mm. of brass, 0.2 of aluminum, and 2 mm. of rubber while the vaginal radium had an additional filter of 1 cm. of gauze. On the second day following the beginning of radiation a vesicovaginal fistula developed. Three weeks later a panhysterectomy was done, and two weeks following this an attempt was made to close the fistula, which failed. Three months later the vagina was closed, and a rectovesical fistula made; however, there was still some drainage of urine below the urethra. Twenty months later the patient had shown no signs of recurrence.

In discussing the case, the author points out that it is very improbable that the fistula was due to the radium but that it occurred more likely as a result of rapid infiltration of the bladder wall by the carcinoma. THEO. W. ADAMS.

Fürst: Preliminary Radiation in Carcinoma of the Cervix and its Influence on Postoperative Infection of Endogenous Origin. Zentralblatt für Gynäkologie, 1925, xlix, 247.

The author is a firm believer in the value of preliminary treatment with x-ray and considers that this not only offers the possibility of improving operative results but that tissues removed after such radiation are extremely important from a histologic standpoint in clearing up many of the problems associated with radiation of tissues in general. LITTLE.

Cotte, C., and Bertrand, P.: The Radiology Study of Uterus and Tubes With Injections of Lipiodol. Gynécologie et Obstétrique, 1926, xiv, 81.

A specially constructed apparatus is used with which pressure can be developed and the return flow of lipiodol prevented. Anesthesia is not necessary. Hospitalization and surgical asepsis should be practised. The bladder and rectum should be empty. Ordinarily the injection of from 5 to 6 c.c. of lipiodol will fill the tubes and uterus satisfactorily, but larger amounts are not harmful. The author has seen no harmful results but reports 3 cases from the literature in which there followed signs of a local peritonitis and four deaths. Collargol was used in most of these cases. Fifty of the cases in the author's series were operated upon soon after the injection, and in no case could any evidence be found of peritoneal irritation.

About 20 cases of acute salpingitis with various complications, including a fully developed acute pelvic peritonitis, have been examined by this method without any evidence of harmful effect. It is suggested that in the future it may be possible to follow the course of an acute salpingitis by lipiodol injections and perhaps even to use this method therapeutically. GOODRICH C. SCHAUFFLER.

Bertrand, F., Villemur, and Baillat, G.: The Radiologic Exploration of the Cul-de-sac of Douglas by the Injection of Lipiodine. Presse Médicale, Sept. 8, 1926, p. 1139.

Noting that in recent articles on the intrauterine injection of lipiodine (or lipiodol) the authors mention the fact that small amounts of the injected material escape into the culdesac without causing trouble, the authors decided to study this region radiographically by the direct injection of this preparation. They report two cases. After careful sterilization the vaginal wall posterior to the cervix was punctured with a fine needle, 12 cm. long, slightly curved anteriorly. At the depth of 3 cm. the injection of 15 c.c. of the solution was made. Three to five hours later, the picture was taken. In the first case, there was no local discomfort; the next morning the patient complained of slight and transient malaise and nausea. In the second instance, the injection was painful, and was followed at once by malaise and nausea lasting for three or four minutes.

The radiographs in each instance demonstrated pathologic lesions not detected by clinical examination, and in the second patient (the only one coming to operation) the condition found on opening the abdomen tallied with the findings on the plate.

The authors recommend the procedure as a safe and simple method of checking the bimanual findings. E. L. KING.

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